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What's Wrong with the Railroad Shops?

Railroad Shop Practice Different from that of Other Machine Shops—Mechanical Departments Badly Handicapped by Poor Equipment—Lack of Contact with Other Shops

THERE ARE TWO kinds of machine shops, ordinary machine shops and railroad shops. If a man had worked in shops where heavy machinery was made, in shops where typewriters were manufactured, in machine-tool shops where tools were built in moderate quantities, in high-production automobile shops, he might think he knew the machine shop. He might have handled work where a split sixty-fourth was close enough and other work where a tenth of a thousandth was a common unit, and yet he would not know the railroad shop which is a law unto itself and different from other shops in almost every particular. Whether this needs to be so is a question, but that it is so is obvious at the first visit to one of these shops and becomes increasingly evident when one visits a number of them.

Not only is the practice of the average railroad shop different from established practice in good machine shops, but it is also unlike that of other railroad shops so that the first impression, that there must be conditions here which make a different practice necessary, is swept away. One finds good machine-shop practice in the railroad shops in spots, a bright spot in this shop, another one in that shop, still another in some other shop. All the bright spots are there if one takes all the railroad shops together, but there are very few in any single shop, leaving untold room for improvement.

The observations made by the *American Machinist* representatives who visited a number of railroad shops covered such items as buildings, equipment (machinery), tools, methods and control. Due to the fact that in some of the shops practically the entire working force was new, it was thought that due allowance would have to be made for the greenness of the hands, but conversation with the management brought out the fact that these new men were an agreeable surprise in that they did much better than was expected and in many cases produced more than the old hands who had gone out on strike. Railroad officials further stated that but a short time would be required to bring the entire force up to, and possibly above, the pre-strike level. Apparently this does away with the old idea that the railroad shop man is different from any other shop man, that his experience must be along different lines, and that the practice in a railroad shop must therefore be different from that in any other shop.

This idea that the railroad mechanic is an entirely distinct species was held and perhaps *is* held quite commonly. It was the basis for the belief of the strikers that they could not be replaced. Of course the work in a locomotive repair shop is different from that in the shop where cash registers or automobiles are made. A certain amount of special knowledge and experience is needed in any shop to make things run smoothly. On the other hand, there is in all shops a great deal of knowledge applied every day which is not special to that particular establishment but which is the common knowledge of well-trained mechanics and engineers. Whether a piece of metal is to be shaped in a certain way for the purpose of applying it to a typewriter or to a freight car makes really no difference provided the respective pieces are the same, made of the same material, to the same limits and in the same quantities.

It was found that the equipment was good in spots only and that there was so little appreciation of the inadequacy of the equipment as a whole that the single machine or single operation here and there, which might be considered good, was shown off, evidently in the belief that here was something superior to ordinary shop practice whereas, as a matter of fact, it was merely above the level of the average in the railroad shop. One of the most striking discoveries was the number of very old machines. In one of the shops the master mechanic had been with his company and in its shop for 22 years and, in all that time, he had received only one new machine tool. Another thing equally surprising was the inadequacy of the tooling for some of the machines. Old and inadequate as these machines were, they were prevented by poor tooling from accomplishing even as much as they might have done.

That the practice in railroad shops is materially different from ordinary shop practice is readily understandable, but why is the practice in one railroad shop so widely at variance with that of almost every other railroad shop?

Why is the equipment generally so archaic and inadequate? Why is the tooling so bad? Why are there so many makeshifts in evidence to the most casual observer? Why is individual output so low? Why is the purchasing department permitted to overrule the mechanical department as to the make of machine tool to be bought?

Answer these questions and you know a large part of the reason why the railroads are having such difficulty in getting their bad order rolling stock in shape. It isn't all a question of machinists and labor unions by any means, as will be shown in this article and the ones to follow.

The American Machinist has made a critical survey of the situation and presents its findings in a series of articles that will run for several weeks. They are unsigned because they represent the work and thought of the staff rather than the efforts of any one man.

Still another weakness exposed was the poor selection of equipment in many cases. There was an instance of what might be called a manufacturing department in one of the shops where brass parts were made to be used in the various shops and roundhouses of that line and where not a single brass working lathe was present, all the operations being done by ordinary engine lathes with geared headstocks. Here was a case where money was spent unnecessarily and the result was an equipment entirely unfit for the work.

It looked like the trail of one of the old-style grafting railroad purchasing agents, most of whom, fortunately, have passed out of the limelight. This case differed from the general run of instances of purchasing department inefficiency in that the equipment was more expensive than necessary. In the vast majority of cases, the recommendations of the mechanical department men, who knew what equipment they required to turn out the right kind of work, had been ruthlessly ignored and cheaper tools, hopelessly inadequate but coming somewhere near the specified requirements, had been substituted. The waste and inefficiency resulting from this method of purchasing is impossible to calculate but it must run into many millions.

Time Lost on Machining Operations

Control also was lacking, not the control of the operations in regard to the repair of locomotives but control of the individual machining operations. The idea seemed to prevail that all effort should be concentrated on expediting the repair of the engine, meanwhile forgetting all about expediting the individual jobs in the machine shop. While it is certainly better to gain one day on the engine as a whole than to gain the work of two days on the details, it is true also that, if this work on the details is expedited, there may be a chance to gain two days on the engine.

Still another thing was the utter lack of uniformity in the machine shop operations. There was apparently no system by which the management of the shops of the various railroads could get in contact with each other. We say "apparently," for we could see no results which might naturally be expected to come from such an interchange of ideas. As a matter of fact, the master mechanics do get together in convention and occasionally do visit each other but each one seems to feel that his own way of doing things is best and consequently nothing that might be called standard practice has been developed. A certain pride in tradition may explain the attitude of railroad shop men so far as their feelings toward each other's work is concerned, but no such feeling should exist where methods of other machine shops are under consideration.

Neglecting Lessons Taught by Manufacturing Shops

Unfortunately the chances of railroad mechanical department men visiting manufacturing shops are remote and they are handicapped to the extent that they have not the opportunity for seeing how jobs are handled in such shops. There may be differences in detail in the way manufacturing shops carry out their operations but unless such a shop comes somewhere near the average efficiency of other shops of a similar nature it is bound to die. In railroad shops this does not seem to be the case, and naturally so, because a railroad shop does not need to show profits.

In shops where production must pay for everything that goes on, bad conditions of tools, faulty methods and systems cannot persist very long without causing the financial failure of the company. But the railroad shop is merely a repair shop. The profits are made by locomotives, passenger and freight cars and the repair shop is nothing but an expense. At least that is the way it may impress the heads of the company because the good work the repair shop does cannot appear on the profit and loss statement. Fortunately the late strike has brought out the fact that the repair shop is a very essential part of the railroad system, just as essential as cars or locomotives. Nevertheless it may be that the idea that the shop is merely an expense and not a producing element is responsible for a great deal of the conditions the writers observed and the reluctance to spend money on the shops. That such policy is wrong would probably be conceded by any manufacturer except, perhaps, by a railroad company, which is also a manufacturer though it may not know it.

Misdirected Economy

Even where possibly five minutes were saved by taking exceptionally heavy cuts (and the word "possibly" should be doubly underscored, as will be shown later), as much as 30 minutes were lost because of the lack of handling devices.

Connecting rods are made in automobile shops. There are certain differences in these connecting rods and there are certain differences in the equipment of the various shops which make them. As a result one will find slight differences in the methods of manufacturing connecting rods in automobile plants, but after all there is very little to chose between the various methods as far as economy goes.

Connecting rods are also made in the railroad shops but there is the widest imaginable difference between the methods employed by one shop and those used by another. This difference is not merely one of method but of economy as well. When we see that in one shop the square block which must be removed in order to form the jaw at one end of the connecting rod is laboriously drilled out, in another shop milled out, in still another shop partly sawed and partly slotted and in still another slotted from beginning to end, we naturally ask why there should be such an enormous difference in methods, especially when the difference also means that in one place 5 or 6 times as much time is used for the operation as in another.

Lack of Tools

In one of the shops the question was asked whether the sawing out of the two long sides was ever considered and the answer was that the method was well known but that there was no saw capable of doing it. There was in that shop a milling machine which might have been used for milling out the block by means of the now well-known method of employing a helical milling cutter, but there was no tool suitable for the purpose. In short, the operation was done that way because the means for doing it were at hand and it was the old way of proceeding.

There is another method that few seem to know of, the method of cutting out the rod ends with the torch. Both the cost of equipment and the speed of operation of that method should recommend it for consideration.

In one shop a connecting rod was being surface milled on a planer-type milling machine. According to a statement from the shop authorities the machine was

not sufficiently powerful to do the work economically but it was exceedingly difficult to get the necessary appropriations for a new machine. Whether an attempt was ever made to get the appropriation was not stated but it may be taken for granted that it was. Accepting the fact that the machine was too weak, this was certainly no reason why a cutter much larger in diameter than necessary was used so that the number of revolutions per minute was lower than it might have been. This, in the case of a milling machine, means reduced production. Nor was there any reason why the cutter should be without rake or with so little chip space that even a light cut would have stalled the machine. The machine was first noticed about 11 a.m. when it was well under way and had milled a considerable portion of the connecting rod. At 3 p.m. it was still well under way but by no means near the end. There is, of course, some satisfaction in seeing an old friend again in the afternoon after one has made up his mind that he will have passed beyond recall in the forenoon. But whether this joy should be experienced with connecting rods seems doubtful.

An Analysis of One Job

Here, then, is a complicated condition. Machine too weak (though there were no visible indications of it). cutter too large and not properly shaped or ground, authorities that were not willing to furnish the proper machine or possibly entirely ignorant of the fact that such a machine was wanted.

Other little items were observed on this job. For instance, the cutter was so much out of round or possibly the arbor was sprung so much that only one-third of the cutter was doing work. With the same machine and the same cutter properly mounted about three times as much work might have been done. If, in addition, the tool had been properly constructed and sharpened, a still further advance might have been made in production. Question: Who is responsible for such conditions and why aren't they corrected?

While we were making some casual remarks about the condition of the cutter, its mounting, etc., the information was volunteered that there were a number of other cutters which might be examined. These cutters were found on a bench behind a post (not in the tool room but in the main shop) covered with dust and in all imaginable conditions of dilapidation. There were perhaps 10 or 12 cutters of which no two were of the same construction or style. Some had inserted blades, others were solid; some had the blades held in by wedges, others by soft metal cast in; still others by a screw which opened a slot midway between two adjacent blades. Nothing seemed to be known as to which construction was the best or why the various constructions were used. Some cutters had rake, others hadn't. Some were merely dull, others had large chunks broken out of the blades. Briefly it was a sickly looking job lot of expensive tools.

Reasons Without Logic

One of the reasons given to explain the absence of the best methods of machining is that after all the locomotive repair shop should first, last and all the time concern itself with the task of repairing the locomotive in the shortest possible period of time and that it is of much more importance to have the locomotive out of the shop and on the road again a day sooner than that several days be saved in various machining operations. Even if a little more time, and consequently money, is spent on the milling of the connecting rod it should be kept in mind, so the argument runs, that this connecting rod is not the final aim and so long as the connecting rod is ready to go on the locomotive when required there is very little reason for complaint. If on the other hand the connecting rod were finished in a minimum time but a day was lost in the getting ready of the locomotive there would be very serious reason for complaint.

This argument is uncontradictable except in so far as it offers no excuse for spending more time on the connecting rod than is necessary. If the superintendent, general foreman or master mechanic, whatever his title may be, needs all of his time and energy in seeing to it that locomotive are not delayed in the shop, there is still the possibility of having somebody else attend to the details and it certainly cannot be said that the locomotive would suffer if the connecting rod were made in less time and at less expense.

The Alibi Generally Used

This idea that everything must be subject to the main aim of getting the locomotive out of the shop seems to be used as a general alibi for all the detail work which is either done wrong or uneconomically. The example of the connecting rod was taken here because it is so easy to visualize the various machine operations which must be done on this piece. The idea of using a parting tool supported in a long slender bar, fastened to the ram of a slotter for the cutting out of the large chunk of metal at one end of the rod is so much at variance with the best present-day practice that it alone would be enough to justify the questioning of railroad shop methods.

That this same operation is done well and economically in other shops, also railroad machine shops, does not improve matters because it is an indication that there is no such thing as a separate and distinct railroad machine shop practice but rather that every shop seems to have developed its own practice and possibly, even probably, that this practice has not been developed but like Topsy has merely grown up.

Politics and the Personal Equation

Then, too, there is in most cases a lack of personal interest in the economical operation of the shop. In but few instances have the men any forceful personalities to be loyal to. It is easy to be loyal to a strong man whom you know, but difficult to be loyal to a mere name which means nothing to you except as so many letters in the financial columns of the morning paper. Neither can railroad shop managers who are notoriously underpaid inspire an enthusiasm which they do not feel. The uncertainty of continuous employment of the shop officials in the past has also had its effect. Railroad politics, usually beginning in Wall Street, have upset the morale in many a railroad shop. This is particularly true where the roads are financially weak, as it seems to be a habit of railroad management to change the whole personnel with the advent of a new president or receiver.

We have asked the question, "What's wrong with the railroad shops?" It is expected that the answer will be completed with the last article of the series. Before going further let us nail down the faults just disclosed:

Inadequate and inefficient equipment.

Ignorance of those responsible as to what is proper equipment.

Improper tooling.

Lack of control of machining operations.
Disproportionate subordination of machining operations to moving the locomotive from the shop.
Insufficient exchange of knowledge and ideas between railroad shops and manufacturing shops.
Inability of those responsible to see that the railroad shop directly affects profits.
Lack of proper work-handling devices.
Prevalence of conditions causing lack of personal interest on the part of shop men in economical operation of the shop.

(The second article will appear Nov. 16.)

Six Ways of Securing Co-operation and Interest From Your Men

By E. O. Kuendig
Factory Manager, The United Electric Company

(1) Always treat your men as human beings and give them a fair deal.

(2) If there should be any shortages in pay, instruct your paymaster to be courteous to the men when they complain and adjust to their entire satisfaction. Make them see clearly that you have done the right thing by them and, if they are wrong, be sure and convince them accordingly. Do not let them go away until they have seen exactly where they made the mistake. If the company is in the wrong and the shortage amounts to dollars, try and give it to them at once. Do not make them wait another pay before they get it. Of course, if it only amounts to a few cents it will be satisfactory I am sure to any workman to let it go until the next pay. I cannot dwell upon this point too strongly, because I have seen so many workman go away from a paymaster's office disgusted on account of not being given courteous treatment. In some cases I have heard them say, "Oh! the Hell with it, what is the use of telling the paymaster about the shortage, he is always right."

(3) Put your cards on top of the table and never do anything underhanded. What I mean is: If you have anything to tell a workman, or if you want to time a man to set a piece-work rate, come right out with it and don't beat around the bush.

One day a foreman came to me and said: "Mr. Kuendig, I would like to have the rate setter time John Doe. I want his job on piece-work, but I'm afraid John is one of those men that will loaf on the job if the rate setter should go up to his bench and tell him we are going to time him. Don't you think the best way would be to have the rate setter stand back of another machine and time him so John wouldn't know anything about it?" I was rather surprised at the foreman and told him so and also gave him to understand that we weren't doing business that way and told him that we would time John and let him know just what we were doing—explain our purpose, show him the stop watch and explain to him how to read it and try to get him interested before we started. It was amazing to see the attitude John took after we were through. In fact, he is now one of the best men to time and always works at his regular speed when we are setting a rate on the job on which he is working.

(4) Check over your payroll each week and make sure each employee is earning a living wage. In other words, see that his pay envelope contains enough money so that he can live and not just exist.

Instead of trying to get co-operation from your employees by spending money on advertising literature, etc., to tack on the shop bulletin boards, put the money in the employee's envelopes and they will be with you forty strong.

(5) Do not try to kill a man by expecting him to overwork himself so that when he gets home he has no "pep" left. Make your motto "A Fair Day's Work, at a Living Wage," so that when he goes home after work, he can work in his garden, if he has one, or take the children out for a walk. By doing this you gain the good will of his wife and family and your employees will like to come to work instead of doing it grudgingly. There is nothing worse than to have your employees come to work because they have to. If you can get them to come because they want to you have won your point and will get the fullest co-operation on all problems.

(6) Always speak to your employees when making your rounds through the factory in the morning. Don't wait for them to speak first, but make it your duty to beat them to the greeting. Never let them get the idea that you think you are better than they are.

In closing I wish to say that if the methods outlined above are carried out, you can rest assured that your employees will be with you at all times and help you to solve your troubles whenever you call on them.

Cutting Down Production

By A. W. Brown

This action of cutting down production, with its corresponding reduction of the working force, is sometimes inevitable, but usually undesirable, not merely that it drives up the overhead percentage, but because it also involves the probability, when full time is resumed, of having to break in new workers to fill the places of those laid-off employees who have found work elsewhere. There is also the distress likely to be caused to the workers and their families.

In general, the humane manufacturer lays off those who have no dependents; and as between any two having none, giving the preference in regard to staying to older men who might find it more difficult to change place of residence or of occupation than younger ones would.

This method of choice does not always make for efficiency in the end, but humanity also has its claims. There are, however, cases where even men having dependents should be laid off among the first. I refer to those who have proved themselves either inimical to the management, or unadaptable to the work and methods in vogue.

Whether to shut down one department altogether, or to lessen production in all, is not always optional with the management. It is important, however, that those who would get the best results from any production organization keep in mind the expensive process of any labor turnover as well as the moral effect of constant changes on their employees.

Some Printing Press Shop Methods

A Crank-pin Drilling Fixture—Pneumatic Presses for Taking Off and Replacing Crank Disks—A Crank Planer Job and a Crankshaft Straightener

By FRED H. COLVIN
Editor, *American Machinist*

THE driving mechanism of the Chandler and Price printing press has a substantial shaft with a disk at each end. These disks carry crankpins which must be in line with each other. One of the disks, the larger of the two, has a cam groove cut on the inside and is a press fit on the shaft. The other is smaller and is a snug push fit.

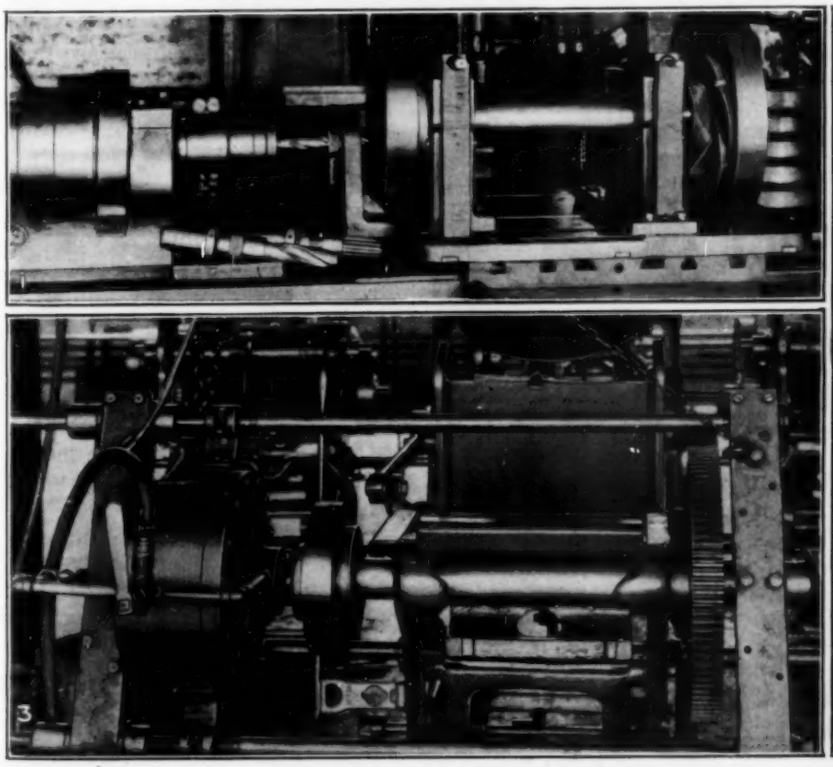
The disks are located by keys and, after being assembled on the shaft, the crankpin hole is bored and reamed in the smaller one in the fixture shown in Fig. 1. The shaft is held in temporary bearings, the disks located by a suitable index and the drill guided by a bushing in a bracket at the end of the fixture. This fixture is mounted on an old New Haven lathe which has been fitted up especially for this purpose. The crankpin hole is drilled and then reamed to size, quick-change holders enabling the tools to be handled rapidly. The hole in the large disk is drilled in a previous operation, a suitable pin in the hole already drilled locating the position of the hole in the other disk.

The next step is to remove the small disk to allow for assembling in the press frame. The disk is pulled off by the special pneumatic puller shown in Fig. 2. The puller is suspended from a chain hoist and guided by the arms *A* and *B* on the rods at each side. Air pressure is controlled by the three-way cock *C*. This view shows the crankpin hole in the large disk at *D* as it rests on the floor block. Another air press forces the small disk in place on the shaft in the final assembly, as shown in Fig. 3. The large disk has had gear teeth cut in the meantime as shown at the right. The forcing press is portable so as to be easily handled by the chain hoist. It is swung over the printing press so that the ram on one end, and the stop in the cross-bar on the other are centered with the shaft. Then air pressure forces the disk in place and it is on to stay. After this, the rest of the assembling goes on to completion, although little more remains to be done.

A Crank Planer Job

The planing of the bed of this press is done on the crank planer, as shown in Fig. 4. The bed has a swinging motion, the fulcrum being at the end of the legs. The casting is located and so lined up that the sides of the bed, which form the roller tracks, will be square with the holes for the shaft in the ends of the legs. The ends of the legs are squared up by means of the gage *A* and the portion of the bed being planed to receive the chase is squared with the bosses through which holes are afterwards bored, by means of the bar *B*. The width of the bed between the raised tracks for the rollers is gaged by the measuring rod *C*. This is rather an unusual job and the crank planer has been found very well adapted to it.

Crankshafts will spring at times and in order to straighten them easily and quickly the pneumatic press



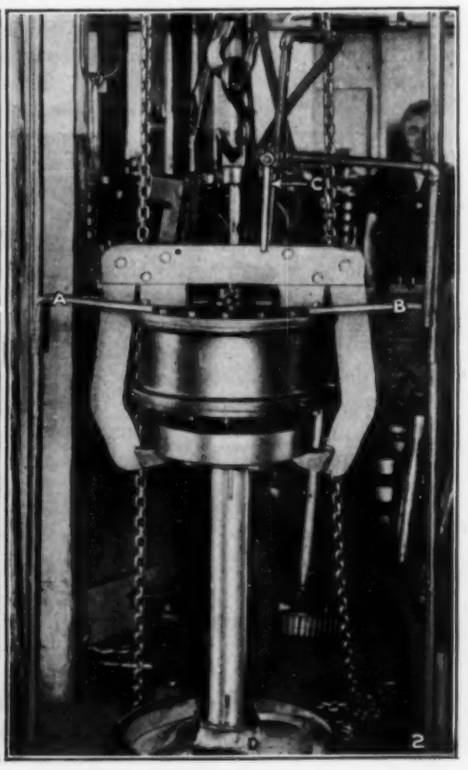
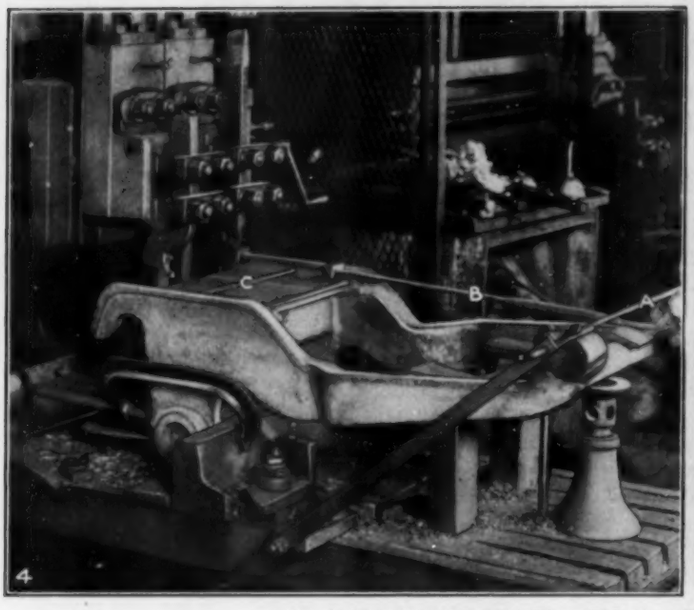


FIG. 1—DRILLING CRANK PIN HOLES. FIG. 2—REMOVING CRANK PIN DISK. FIG. 3—ASSEMBLING THE GEAR SHAFT



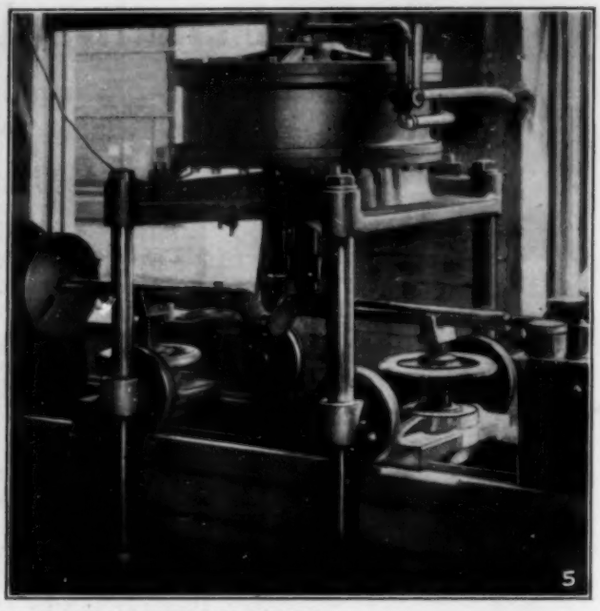


FIG. 4—PLANING THE BED. FIG. 5—AN AIR STRAIGHTENING PRESS

shown in Fig. 5 has been built especially for this work. Here again an old New Haven lathe forms the bed for the operation. The press is mounted on four wheels which fit the outer ways on the lathe and enable it to be easily moved to any position. Cross-bars under the bed, together with the four rods, take the thrust. The shaft is mounted between centers but the stress of the bending is taken by the two adjustable supports, *A* and *B*, which can be easily moved to any position on the bed by sliding them on the inner ways. This arrangement makes a very convenient straightening press and the method can be easily adapted to other work.

Coming Management Methods

BY ENTROPY

When we were beginning to furnish munitions for the World War we found ourselves in such keen competition for all kinds of skilled and unskilled labor that most firms of any size organized departments primarily for the acquisition of workmen. These departments, however, soon found that it was cheaper to try to keep the labor they had than to secure new workmen only to lose them to some equally enterprising representative of another shop. From this grew the art of employment management, so-called.

When business gets much better than it is at present, there will be a rush to do this same thing over again. We have not the ready means of recruiting labor by the ship-load from foreign lands as we had previous to the war and therefore only a slight demand for labor over that at present in existence is inevitably going to place it at a premium and continue the constant accusations of "stealing" help and the same keen and unscrupulous enticing of workers from one field into another. This usually results in transferring a floating labor body from one center of departure to another, never stabilizing it anywhere.

Are employers going to see the futility of this lack of management and are they going to adopt means for training the local population to do their work and treat it well enough so that the desire to roam does not prevail? If they do it will be because the idea is sold to men higher up in the organization than most employment managers have been. It will be because superintendents, general managers and presidents see the necessity and direct that their shops be run in accordance with that idea.

It becomes simply a matter of dollars and cents. How far will a thousand dollars go when invested in wages? Will it go further if invested in improved working conditions? Will it go further in an athletic field? How about shorter hours or longer hours and overtime pay? Is good foremanship a good investment? Does it cost more, or less, to lead men rather than drive them? All these questions and many more will have to be answered by someone who has his finger on the pulse of the finances as well as on the sentiments and ambitions of his workmen.

This is a job for the business management. It is inseparably tied up with cost accounting, planning and distribution of work, with efficiency, and it will ultimately have to be handled in connection with all these and other branches of management. We are dealing, on the one hand, with dependable figures, as to tonnages, power costs, and handling of materials, all of which can be established with fair certainty that they will be where we left them when we shut down last night. On this hand we deal with human beings whose temper and temperament, hopes, fears, and health, both mental and physical vary from moment to moment and require the services of the most expert of psychologists.

These psychologists will have to include boards of directors and managers even more than employees in the personnel offices. We will have experts in human engineering just as we have experts in mechanical, or electrical engineering, men who will advise, not the employment manager, but the general manager. All these things suggest a new era in management, a time when boards of directors will consider gravely the questions which during the last days of hectic business were left to chance or to untrained men in the employment office.

Industrial Standards in Germany

Work of Establishing Standards Is Under Direction of Central Committee—Has Been in Progress for Four and One-Half Years—International Co-operation Desired

By H. O. HERZOG

STANDARDIZATION in Germany dates back to the second half of the last century. It had existed, as in other countries, to a certain degree before that time but was restricted to a limited number of articles. Its applications were few and far between and were, in the main, the result of custom, which in the course of time has caused some standards to be more or less generally adopted as a matter of expediency. Such cases were the standardization of structural steel, sheets and wire, which originated in 1873 and has since been in constant progress. Standardization of pipes followed in 1882, restricted to cast iron pipes, while in the case of wrought-iron pipes the English standards prevailed. The latter were followed in many cases, the foremost of which is the British Whitworth screw thread.

The greatest progress was made in the standardization of railroad material, where conditions were most favorable; the railroad management being centralized in a few hands. Although energetic pioneer work was not lacking and foreign progress acted as a spur, standardization by deliberate and systematic action was slow and strictly tentative. Germany has always been peculiarly reluctant to take the initiative in such matters. This attitude must be ascribed to the strongly pronounced leaning toward an international treatment of the problem. Purely national standardization was and is still considered an incomplete solution. German engineers have been eager to co-operate with other nations, but were averse to proceeding alone. The most striking instance of this attitude is probably the establishment of the metric screw thread, of which Germany was the originator.

For such reasons standardization as a prominent problem of industry has remained considerably behind the developments in the United States and England. No pressing need was felt for its furtherance, and the reluctance to take independent action checked individual efforts. A strong impulse has evidently been lacking. This impulse was supplied by the exigencies of the war which, as in other countries, taught the country a sharp lesson in the matter of quantity production. Imperative necessity has overcome the latent resistance; furthered by the fact that international procedure had become a mere remote possibility. The long deferred problem of standardization was then seriously taken in hand.

The initiative was taken by the War Office Department of Arms and Ammunition, which entrusted its execution to the Society of German Engineers. Under the leadership of the latter a standardization committee was formed for the machine-building industry, in which a number of other associations, like the Society of German Machine Tool Builders, of Tool Makers, the Association of Wood Working Manufacturers, Steam Engine Manufacturers and others, were represented. This committee commenced operations in direct and most intimate relation with the government offices, and was primarily subservient to the needs of the war industry. The first step taken was to make a survey of the standards which had grown up in various works and get the latter into contact, with a view to bringing about an interchange of experiences. The first actual work taken in hand was the standardization of cylindrical and taper pins, drills, keys, and temperatures. This Standardization Committee soon spread out into an organization comprising the whole industry, which was formed in December, 1917, under the name of Standardization Committee of the German Industry.

> THE standardization work of Germany is keeping strictly within the scope of standardizing parts and units, measurements and dimensions. The Committee is averse to venturing upon the field of standardizing aggregates. No pressure is exercised upon any industry for adopting the new standards, but it is hoped that in the course of time this adoption will gradually proceed of its own accord. Summing up the present situation, it can be said that the industry as a whole is receptive and the necessity for thorough standardization is recognized as a principle everywhere. It is felt, however, that the progress is somewhat slow, and that an energetic propaganda is needed for speeding it up.

The organization has since then been considerably enlarged, and reflects now in its elaborateness the inherent thoroughness of the German. It is composed of a head committee whose function is to supervise and direct the work along broad lines, while the actual work is carried out by managing committees which are formed, one for each specific task, and of which there now exist a large number. The head committee comprises representatives of government offices, like the Post Office, the Navy, National Economic Ministry, Ministry for Public Works, Ministry of Finances, War Ministry, the Patent Office, the Physical and Technical Institute, the Polytechnic High Schools, the National Testing Laboratories, and those of a great number of manufacturing associations.

All groups of industry in which standardization work is carried on are represented. It is presided over by a board consisting of prominent men of the industry, of the railroad administration, and several government officials. It maintains a permanent office, where the chief function is to remain in constant contact with a large body of advisers recruited from producers, consumers, government offices and scientists.

The proceedings are conducted in the following way: After deciding upon the standardization of a certain article, on the initiative of the committee or on suggestions from outside, connection is established with the groups already mentioned—producers, consumers, officials and scientists—with a view of procuring material to work upon and to arrive at a definite primary understanding. Then the work is passed on to a managing

committee elected for this purpose. The principle underlying the procedure is to systematize the information received, so far as is practicable, special care being taken to insert new standards if the demand for such exists. The opinion of the industry on proposed standards is invited in the fullest possible way.

After being completed it is, by publication in a journal, submitted to public criticism for a specific period. After this period has expired, the comments received are scrutinized, and thereafter it is the chief task of the managing committee to find a suitable compromise between the conflicting criticisms and counter-suggestions submitted. The result is then passed on to a consulting committee consisting of a number of prominent men of industry and technical scientists. The members of this consulting committee are carefully chosen to exclude any possibility of private interests playing a part in its deliberations. The approval of the committee finally decides upon the proposed standardizations.

Committee Active

A great deal of work has been completed during the four and a half years of the committee's existence. It comprises nearly all parts of industry; machine building being predominant. The starting point of the new organization was to lay down fundamental diameters, a matter concerning the industry as a whole. As the decimal system made it impossible to adopt pure arithmetical progression, considerable difficulty was encountered at first. It was found necessary to circularize a large number of manufacturers in order to find out the most customary diameters and those little used. Upon the replies received a system has been built up, which, adhering to arithmetical progression as far as possible, avoids decimals by rounding out figures according to prevalent customs. A preference for certain diameters and aversion to others could easily be observed and this was the means of guiding this work towards a basis for the ultimate determination of standard diameters.

Amongst the work for machine building completed may be mentioned the following:

Mathematical formulas, sizes and execution of drawings, temperatures, figures, diameters, tapers, radii, screw threads, fits, bores, shafts.

Standards of machine-building material: copper, brass, bronze, cast iron, steel castings, drawn and rolled steel.

Hardness tests, Brinnell method.

Keyways, drill jigs, drills, counterbores, thread-cutting tools, grinding disks, cutting tools, measuring tools.

Long List Completed

Handles, spigots, handwheels, keys, chains, ball bearings, cranks, bushings, rivets, pipes of mild steel, lubrication rings, bolts, nuts, spanners, washers, stuffing boxes, gears.

The standardization committee is often confronted with an overwhelming number of existing sizes. Following a line of compromise, the elimination achieved is not radical but constitutes a decided progress. This may be seen from the following instances giving the number of standard sizes which existed prior to standardization and those remaining after:

	Sizes Before	Sizes After
Keys of less than 100 m/m width	298	44
Transmission shafts of 30 to 200 m/m diameter	28	17
Clamp and flange coupling	124	14
Hanger bearings	146	46
Pedestal bearings	33	14

The standardization of threads has this year been concluded. Inquiries of numerous firms have disclosed the remarkable fact that the Standard International metric thread has made comparatively little progress and has not been able to replace the Whitworth thread, not to speak of numerous other thread systems used.

Original Idea Abandoned

The original intention to make the adoption of the S.I. metric thread general has been abandoned in view of the strong leaning of the industry towards the Whitworth thread, and efforts have been concentrated towards eliminating the other threads in use. At the present stage of standardization two recognized threads for machine building remain, the metric thread with an angle of 60 deg. and the Whitworth thread with an angle of 55 degrees. Of the great number of special threads only a few have been retained, like the saw-tooth and buttress thread and the round thread (wire thread).

The following data show the economy achieved by the now concluded standardization of threads:

	Before	Now
Thread systems	10	2
Kinds of threads	274	72
Tools:		
Thread gages	548	144
Taps	822	226
Dies	548	144

The S.I. metric thread in diameters of from 1 to 150 m/m. and the Whitworth thread from ¼ in. to 6 in. are now completely standardized. The Whitworth thread coincides with the standards of the British Engineering Standards Committee. Another large task was the standardization of forged and machined screw bolts. Starting with heads round, square and hexagon, points and nomenclature, the standardization of bolts is now almost completed and has brought about a considerable reduction of existing sizes.

Further Progress

As an indication of further progress, recently made, may be added the standardization of pipes by bringing the existing standards into harmony and establishing standards for high, medium and low pressure. Formerly the flanges and their screws were different for the various pressures, while after the standardization their dimensions are adjusted according to the size of the pipe, independent of the pressure.

In several lines of industry, as in motor-car manufacturing, and the electrical industry, standardizing work is carried on by independent committees formed by the respective manufacturing associations; but even in such cases where the work is decentralized provision is made for connection with the head committee in order to eliminate interference. The desire, already mentioned, of German engineers for co-operation with other nations, chiefly England and America, in the matter of standardization has never been quite effaced, and has, with the restoration of peace, almost regained its former force. The viewpoint that isolated standardization in the various countries stands in the way of an international treatment of the subject has, however, been abandoned and the theory adopted that the former has to precede the latter in order to create a basis for it.

This thought was strongly emphasized in a conversation your correspondent had with Mr. Hellmich of the Society of German Engineers, in whose hands the permanent work of the organization rests, and who wishes it to be pronounced emphatically that German

engineers have no intention whatsoever to establish German standards with a view to use them as a weapon in international competition. They strongly hope that the parallel work going on in the various industrial nations will ultimately lead to concerted action based upon the existing national standards. The German Standardization Committee is glad to perceive that this idea is finding full understanding with similar organizations; proof of which is the connections that have already been established. Such connections, of an official nature, exist already between the German Standardization Committee and most others; as the American Engineering Standards Committee, the Canadian Engineering Standards Association, the Austrian Standards Association, the British Engineering Standards Association, the Standards committees in Holland, Italy, Sweden and Switzerland.

In a few instances where such is not yet the case, personal relations have been taken up. An exchange of approved standards is taking place between existing standardization committees. The standardization sheets, which are in themselves strictly standardized and made up alike with the sole difference of language, make comparison easy. As a first step towards closer co-operation, this exchange is said to have been entirely successful. Any further steps in this direction will be heartily welcomed by the German Standardization Committee.

The standardization work of Germany is keeping strictly within the scope of standardizing parts and units, measurements and dimensions. The committee is averse to venturing upon the field of standardizing aggregates. The reception of their work by the industries is said to be satisfactory although it can be seen that in cases where tradition is strong the introduction of new standards meets with considerable resistance. Such resistance must be contended with, however, as it could not be expected that manufacturers will go to the expense of adjusting themselves at once to new standards. No pressure is exercised upon any industry for adopting the new standards but it is hoped that in the course of time this adoption will gradually proceed of its own accord. Summing up the present situation, it can be said that the industry as a whole is receptive and the necessity for thorough standardization is recognized as a principle everywhere. It is felt, however, that the progress is somewhat slow, and that an energetic propaganda is needed for speeding it up.

Automatic Electric Temperature-Regulating System for Furnaces

By I. William Chubb
Editor European Edition, *American Machinist*

The firm of Adolphe Saurer, Arbon, Switzerland, which build commercial vehicles for practically all the countries of Europe, have in their heat-treatment department a system which automatically controls the temperature of the furnaces by varying the position of the dampers. Coke is used as fuel and the same system will obviously apply to coal-heated furnaces. Where gas, oil or electricity are employed, however, a somewhat different scheme will be necessary. The appliance can be set so that the desired temperature, once obtained, can be maintained for any length of time with an accuracy ±1 per cent at low temperatures and ±.75 per cent for high temperatures.

Fuel Consumption Minimized

The system controls six furnaces working equally well whether the temperatures in these furnaces are the same or differ, and the firm state that the heat remains so steady without special attendance that the recorders trace horizontal lines. The fuel consumption being proportionate to the average temperature, is minimized and the furnaces can be worked with a smaller number of attendants, but the chief merit of the temperature-regulating device is that as far as it goes it guarantees the correct heat-treatment and thus ensures the high quality of materials required in the finished product.

In Fig. 1 is illustrated the exterior of the mechanical part, the heat being varied by controlling the draught in the chimney with a slide, which is itself controlled by the electric regulating device to be described. This view shows a horizontal shaft, which carries a double-arm lever, with one end connected by a rod to the chimney damper. To compensate for the weight of the rod and fittings, a counterweight is carried on the other arm and the housing contains two magnets the function of which is to rotate the shaft enough to raise or lower the regulating damper.

The control system is illustrated in Fig. 2. From the thermo-electric pyrometers placed in the furnaces, current is taken to an ordinary galvanometer *A*, the switch device *B* enabling any one of the six thermocouples of the six furnaces to be connected up so that the galvanometer will indicate the temperatures of the furnace put in circuit. At *C* is a similar galvanometer except that, instead of the temperature scale, it has two parallel arc-shaped troughs filled with mercury and concentric with the axis of the needle of the instrument. Both troughs are contained in a block of vulcanite, one trough being divided at the middle into two portions by a mica partition. The glass pointer of this galvanometer is provided at the free end with a U-shaped platinum wire, connecting when necessary one trough with the other. Normally the U piece does not dip into the mercury, above the surface of which the needle plays freely.

By means of a switch *D* the pyrometer of any furnace

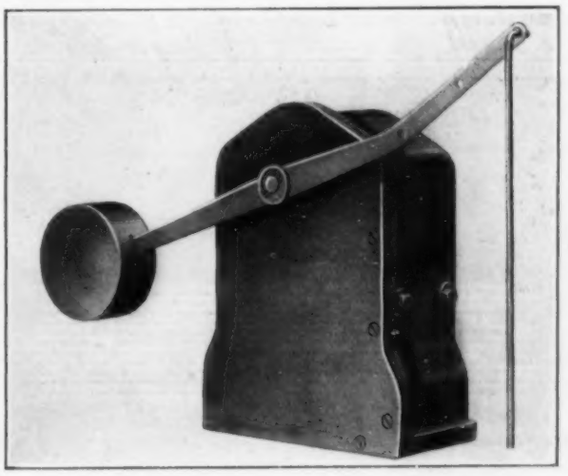


FIG. 1—DAMPER ACTUATING ROD AND MAGNET HOUSING

can be connected to the contact galvanometer *C*, the needle of which will travel to a certain point depending on the temperature. At intervals the wire hoop visible at *E* is caused momentarily to press the galvanometer indicator downwards, the platinum wire then dipping into the mercury if the temperature is incorrect. By this means a circuit is closed which, according as the temperature is too high or too low, that is, according as the pointer dips into the mercury trough to the right or left, will permit a heavy current to pass, to excite the electro-magnets in the housing (see Fig. 1) and cause the damper to close or open.

The switch *D* is operated by the motor *F* so that the six furnaces are connected up in turn. The motor also serves to press the hoop *E* downwards, the power required for the motor being in the order of 0.02 hp. It is arranged that there is no voltage on the circuit when the platinum hoop dips into or emerges from the mercury and consequently, as the platinum contact is not subjected to wear or dirt due to sparks, its life is practically unlimited. The speed of the motor and the gear ratio have been chosen so that the regulation of all six furnaces requires about 3 min. The temperature of each furnace is therefore controlled every 3 min. and when, by the limits mentioned, it is higher or lower than is required the damper can be adjusted.

If the furnace temperature is correct, the needle of the galvanometer seats itself directly over the mica partition, preventing contact between the two mercury troughs. While the position of this partition is determined by the construction of the galvanometer, adjustment of any desired temperature is made possible by inserting in the pyrometer circuit of each furnace a suitable resistance so that the galvanometer needle is over the mica partition at the required temperature, whatever it may be. Fig. 3 illustrates the size resistances of the lower part of the apparatus. In front of each is a scale for temperatures from 170 deg. to 1,090 deg. C. Each scale carries a device for adjusting the resistance, together with a pointer which indicates the temperature.

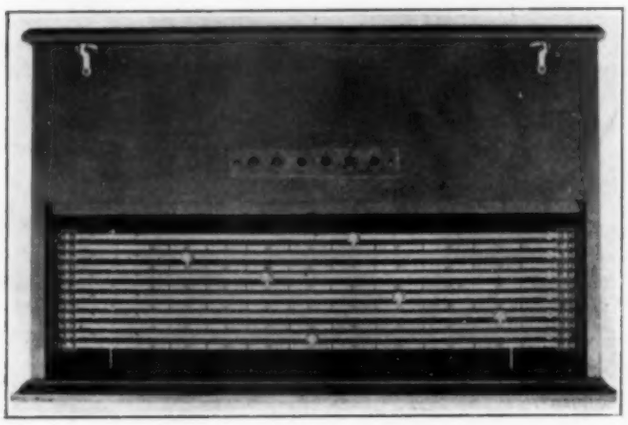


FIG. 3—GALVANOMETER CIRCUIT RESISTANCE UNITS

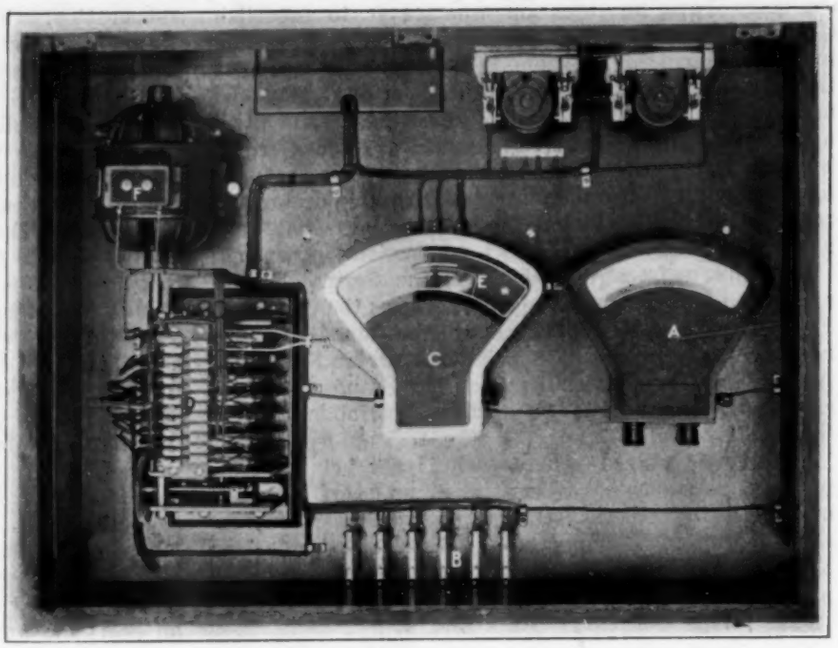


FIG. 2—GALVANOMETER CONTROL PANEL

Cutting Oils vs. "Soap Water"

By H. B. Egg

In an endeavor to learn what is the best practice in using cutting lubricants, the writer visited a number of high class shops, hoping to profit by their example. I returned with lots of information, but little satisfaction. Below are tabulated the results of my investigation, omitting names:

	Our Shop	1st Shop	2nd Shop	3rd Shop
Milling machines	Water	Oil	Water	Water
Gear cutters	.....	Water	Water	Oil
Hand turret lathes	Water	Oil	Water	Water
Automatic screw machines	.....	Oil	Oil	Oil
Drills	Water	Water	Water	Water
Cold saws	Oil	Oil	Water	Water
Threading lathes	Water	Oil	Oil	Oil
Thread millers	.....	Oil	Water	Oil
Hack saws	Water	Water	Water	Water
Broaches	Oil	Oil	Water	Water
Engine lathes	Dry	Oil	Water	Dry
Boring mills	Dry	.....	Water	Dry
Grinders, (Production)	Water	Water	Water	Water
Grinders, (Drill)	Dry	Water	Dry	Water
Grinders, (Cutter)	Dry	Water	Dry	Dry

Under the name of "water" are included all of the various emulsions and compounds using water. The different kinds of oils used was amazing, ranging from lard oil to *near* lard oil mixed with varying proportions of paraffin oil. One shop kept down the cost of its oil by mixing with it a big percentage of kerosene.

Our rule had been to use water where much heat was developed and where the sizes were not held to close limits, or anywhere else if we felt like it. We used oil on forming operations and on tools which we wanted to keep sharp a long time. For tapping, we used machine oil or any old thing handy, and the other shops visited did not have anything on us in that respect.

It appears to us that shops buy cutting lubricants or coolants from the most convincing salesman and continue to use his brand until a more persuasive talker pays a call. There should be a more scientific method of selection.

Methods of Machine Tool Design

Further Continuation of the Subject of Cam Feeds for Machine Tools—Beginning of the Analysis of a Screw Machine Drum Cam

By A. L. De LEEUW
Consulting Editor, *American Machinist*

THE timing of cams aims at a construction by which all the cams used will co-operate without interference and without loss of time. Merely avoiding interference would be easy by allowing a sufficient amount of time between the successive operations of various cams to make sure that the functioning of one has completely ceased before the work of another one begins. In doing so, however, one would sacrifice a certain amount of time which might well be saved by a careful analysis. Such an analysis should be undertaken every time a new job is put on a given machine. The designer of a special machine, arranged for one operation only, has practically the same task before him as the man who arranges an existing machine for a new job. When a standard machine must be designed, the problem is somewhat more complicated. Even with a special machine the timing of cams is somewhat more complicated than the arranging of a standard machine for a new job.

Some of the operations performed by an automatic machine require a variable amount of time, while other operations always require the same period. Instances of the first kind are the turning, or boring, or reaming on an automatic screw machine. Instances of the second kind are the stock feed, indexing, and shifting of belts. Conditions are still further complicated by the fact that, though the indexing might always take place at the same speed, the machine may be so arranged that the index speed cannot be kept constant. As a rule, such operations as indexing are carried out on the high speed (if there is one). In some machines this high speed is constant, in others it is variable. As illustration of the various possibilities, we cite the following examples:

Fixed Ratio Between High and Low Cam Speeds

In the original Spencer machine there was a fixed ratio between high and low speed of the cams. This ratio was established through the differential gearing in the feed pulley. With a given machine this ratio could not be changed. If it was desirable to reduce the feed, or rather, lengthen the cycle, for a certain piece of work, the feed pulley was run at a lower speed so that all operations were carried out at a slower rate. Indexing, stock feed, shifting of belts, all was done slower, not because it was desirable to do so but because it was necessary to have a slower cutting feed or perhaps because a piece was longer or of harder material.

At other times it might be desirable to shorten the time for a complete cycle and this was done, of course, by giving a higher speed to the feed pulley. Here we would run up against another difficulty. It was not possible to reduce the cycle below a certain point, because increasing the feed had also increased the speed of indexing and it would be imposible to index at too rapid a rate. As a result, it was often necessary to take more time for a complete cycle than was actually needed for the cutting operations, simply because some of the idle operations could not be carried out with the proper speed of the feed pulley.

In machines like the Cleveland machine, the high speed is constant, whereas the various feeds are adjustable entirely independent of the high speed. High speed and feeding movements, however, are tied together in one cam and there is no possibility that any of the cams can get out of time with any of the others. On the type of machine represented by the Brown & Sharpe screw machine we find a different set of conditions. It would be possible here to arrange this machine so that one operation might interfere with another, for instance, by wrongly setting the dogs, or by the failure of one of the idle operation cams to act at the proper time. In this machine the cam which gives the forward and backward motion to the slides and turret runs at a constant slow speed, that is, its speed is constant during the job, though it may be changed for the next job. The movements of the cams for idle movements run at a speed which is always the same regardless of the speed of the main cam.

Problem of the Automatic Screw Machine

For the reason that there are so many different combinations possible, it is exceedingly difficult to indicate a system by which cams can always be timed properly, unless we reduce the movements of the various cams to one common unit. This unit is the revolution of the work spindle in the automatic screw machine. In some other machine it might be a stroke or a reciprocating tool. In still other machines it might be some other function again.

Confining ourselves for the present to the automatic screw machine we would say that it requires so many turns of the spindle to complete the first cutting movement, so many for the second, so many for the third, etc. We would determine the high speed by the maximum speed we would dare to give to the parts operated upon; for instance, the speed of indexing. From this high speed we would calculate the number of seconds required for each of the idle movements as well as for the different returns, and we would then reduce that number of seconds to revolutions of the work spindle, so that we would obtain the total number of revolutions of this spindle for one complete cycle. We will illustrate this by a concrete example and assume that the following conditions exist:

The machine has a constant high speed for cams.
The various feeds are made by the different slopes given to the cam.
The cams can be given various speeds for the feed movement by change gears.
All cams are geared together.
The work revolves at 300 r.p.m.
First operation requires stroke of 1 in., feed of 0.010 in.
Second operation requires turret feed of 1 in., drilling feed of 0.006 in., and feed of cross slide for forming of 0.0025 in.

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Depth of forming is $\frac{3}{8}$ in.

Third operation requires length of stroke of $\frac{1}{4}$ in., feed of 0.005 in.

Fourth operation requires a length of stroke of 1 in., feed of 0.015 in. and a cross feed for cutting off of $\frac{1}{8}$ in., feed of 0.002 in.

Fig. 170 is a diagram in which all these various movements are laid out, each one for itself and without regarding any of the other movements which may take place at the same time. The lower bar takes care of the turret motion, the second bar takes care of the cross-slide movement, the third one of the index, the fourth of the opening and closing of the chuck, the fifth of the stock feed.

Duration of Cutting Operation

As the first cut is 1 in. long and the feed is 0.010 in. per revolution, 100 revolutions will be required for this cut. In a similar manner we figure that the second, third and fourth cut taken by the turret tools will require $166\frac{2}{3}$, 50 and $66\frac{2}{3}$ revolutions respectively. We also find in a similar way that 150 revolutions are required for the feed of the forming tool and 250 revolutions for the cut-off tool.

In regard to the index, we will assume that it was found that one second is required to complete the various operations necessary for one indexing. These operations include the withdrawal of the locking pin, the moving of the turret, and the replacing of the locking pin. As one second of time corresponds to five revolutions of the spindle, and as we have assumed four stations of the turret, four times five revolutions of the spindle will be required for all of the indexing

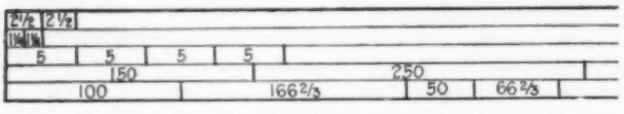


FIG. 170. DIAGRAM OF SCREW MACHINE OPERATIONS

movements. We will further assume that $\frac{1}{4}$ of a second was found practical for the opening and closing of the chuck and that $\frac{1}{2}$ second is required for the stock feed and another $\frac{1}{2}$ second for the return of the feed shell. This will give us $2 \times 1\frac{1}{4}$ revolutions for the opening and closing of the chuck and $2 \times 2\frac{1}{2}$ revolutions for the stock feed. In this manner we have obtained the chart of Fig. 170. Though we have taken care of all of the elements which our operation requires, we have neglected to consider the time which may have been spent on account of the peculiarities of the cam.

Our machine is a special one and we can assume any slope of the cam which we may deem desirable. We will assume a slope of one to three for the feed and forty-five degrees for the return. We will further assume that the cam roller is $1\frac{1}{2}$ in. in diameter. Laying out Fig. 171, in which AB is the cam slope for feeding and BC that for return, and placing the roller at the points A and B, we notice that the distance traveled by the roller along a horizontal line is more than the base of the triangle of which the height is 1 in. This little distance A_2A_3 must be added to the time required for the feed of 1 in.

We will now lay out Fig. 172 which shows all of the feed and return strokes side by side. This diagram shows us something which was overlooked, namely, that the slopes cannot be the same, except when the feed per revolution of the spindle is the same. We see that operations *2* and *3* have a gentler slope than operation *1*, but that operation *4* has a much steeper slope. This operation *4* happens to be a reaming operation in our case, so that a steep slope is permissible. However, in some other case we might have been compelled to make the slope of operation *4* more gentle, say one in three,

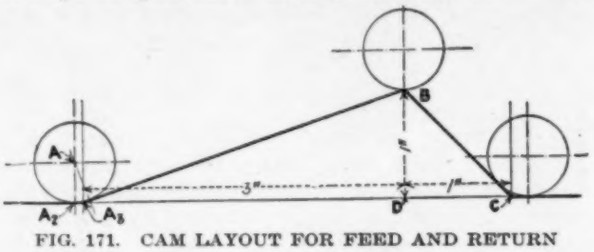


FIG. 171. CAM LAYOUT FOR FEED AND RETURN

and in that case the slopes of the other three operations would have been gentler than shown in this diagram.

It also brings before us at once something else which we have so far neglected, namely, the advance of the tools. It may well be that the tools are set in such a manner that only a very short advance is required, but as a rule this is not the case and for our illustration we will assume that the final position of the turret at the end of the feed stroke is always the same regardless of what was the amount of the feed. We will further assume that, for the sake of safety, we have

FIG. 172. DIAGRAM OF FEED AND RETURN STROKES SIDE BY SIDE

allowed one extra inch of advance in all cases; so that we would have for operation *1* one inch advance, one inch feed, and 2 in. return; for operation *2* the same; for operation *3*, $1\frac{3}{4}$ in. advance, $\frac{1}{4}$ in. feed, and 2 in. return, whereas the fourth operation will be the same again as the first two. This makes our diagram as shown in Fig. 173.

It would be possible to calculate the extra distances which we have to allow due to the curvature at the point where two parts of the cam join but this would involve a large amount of calculation and we will find it to be easier to determine these amounts graphically. With this in view we have laid out Fig. 174. In this diagram the length of the cam is the distance from A to B, which we find by measurement to be $30\frac{1}{2}$ in.

Without going further with this cam, we now start the consideration of the cross-slide cams. Looking at our schedule of the various operations performed by the machine, we find that the forming takes place at the same time that the second turret tool operates. This turret tool requires $166\frac{2}{3}$ revolutions of the spindle, whereas the forming tool requires only 150 revolutions. Thus, if we can start both operations at the same time, we will find the cross-slide ready to return before the turret tool is in that condition. This will give us a

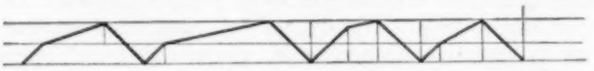


FIG. 173. DIAGRAM WITH ALLOWANCES FOR EXTRA ADVANCE

chance either to start the cross-slide tool somewhat later, to finish with it somewhat earlier, to give a dwell to the cross-slide tool at the end of its forming operation, or to have a combination of these things.

When we look at the second cross-slide operation, we find that it corresponds to the fourth turret tool operation. This fourth turret tool requires only $66\frac{2}{3}$ revolu-

tions for its completion, whereas the cutoff tool requires 250 revolutions. Before deciding how to arrange the relation between these two, we must consider what these operations mean. It stands to reason that the reaming operation must be finished before the cutoff operation is completed. It also stands to reason that the reaming tool must be completely out of the hole before the finished piece drops off, so that the fourth operation not only must be finished but the turret must have returned before the cut-off is completed.

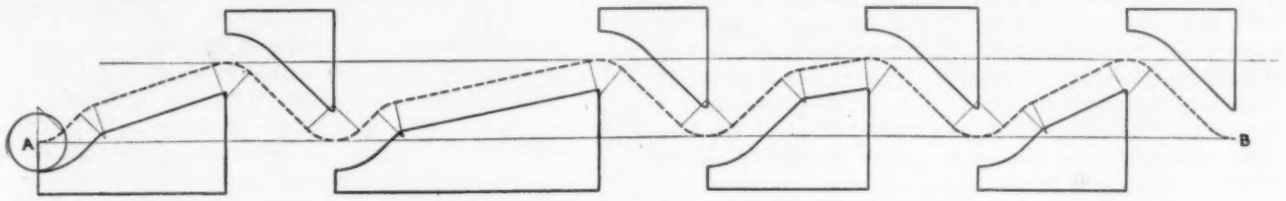


FIG. 174. GRAPHICAL DETERMINATION OF CURVATURES

Looking at Fig. 174, we see at a glance that the total distance required for feed and return on the fourth operation is less than the distance required for the feed only of the second operation and, as this latter feed corresponded to 166⅔ revolutions of the spindle, realize that the entire reaming operation with its return can be accomplished in less than 166⅔ revolutions and, therefore, will be completed within the time required for the cut-off.

Control of the Cross-Slide Tool

We now construct Fig. 175, which shows the center-line of the roller movement of Fig. 174, and immediately above a similar center-line for the roller movement of the cross-slide tool. We will imagine that these latter tools are controlled by a cam just like the one we are constructing. As a rule this latter assumption is not correct and we are making it here merely to simplify our first analysis. We notice that the feed begins in the lower diagram at the line *AA*, but that we are still at the advance in the upper diagram. To correct this we can do one of two things: We can either place the upper diagram further to the left—in other words, start the advance of the cross-slide tool a little earlier—or else place the lower diagram somewhat to the right—in other words, start the feed for the turret somewhat later. This instance shows how necessary it is to combine the diagrams for the various cams, because, merely looking at our original schedule, it would have seemed that we would have a surplus of time for the forming operation.

Nevertheless, it is well to look at things before making a picture of them. Though our conclusions were faulty, the thoughts which led up to them were necessary, because without them we would not have constructed Fig. 175 for a check and we would not have found the true condition of affairs. We see at the line *BB* that we are still on the feed of the cross-slide after we have started the return of the turret, which means either that a part of the return of the turret would be on the slow motion or else that we must make the shift mentioned before. At the line *CC* we notice that we are still on the return for the cross-slide when we are on the dwell of the turret. If we had started some other action at *C*, we might have interfered with the return of the cross-slide. At *D* we notice the same thing we have noticed at *A*, namely, that we are still on the advance of the cross-slide when the feed of the turret has started. This means that we have to shift the upper diagram to the left. When we make a shift sufficient to start feed of cross-slide and turret at the same time, we will find that the entire operation of the turret, its feed and return, are completely finished when we are still on the feed of the cross-slide. In other words, we see that the return of the turret takes place on the low speed and that even then there is time to spare. It will therefore be possible to make the return line for the turret at a more favorable angle than 45 deg., and that without loss of time.

We have estimated the time required for the remaining operations in seconds and reduced them to revolutions of the spindle, that is to say, we figured one second for the index and said that this is one-sixtieth of 300, or five revolutions. When we said that the first turret operation required 100 revolutions we could determine how much of the circumference of the cam would be required for this operation because the slope of the cam was known. The return, also, was easily determined because the amount of cam required for this function depended entirely on the amount of return and the slope of the return cam. When it came to determining the amount of space to be allowed on the cam for the period of indexing, we had no such data and we attacked this problem from a different angle.

Cam Space for Indexing

To make the problem we have before use somewhat clearer, let us imagine that the diameter of the complete cam drum is 10 ft., which is, of course, a very much exaggerated figure. Let us further imagine that this cam drum makes 60 r.p.m. when it runs at its high speed. Then its circumferential speed is practically 30 ft. per second. We have found from Fig. 174 that a length of about 2 in. of the cam drum is required for the return of the turret. As 2 in. is $\frac{1}{180}$ part of 30 ft. (the circumference of the drum) it would take only $\frac{1}{180}$ part of a second to return the turret. This shows clearly that we are not free to assume any diameter or any speed of the cam drum. We will therefore select some figures which are more nearly practical.

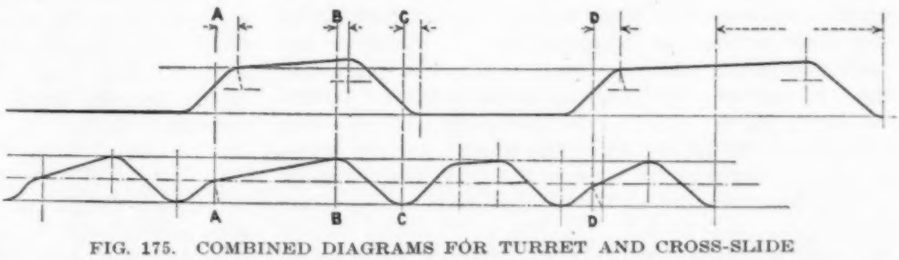


FIG. 175. COMBINED DIAGRAMS FOR TURRET AND CROSS-SLIDE

though we cannot be certain that we shall be able later on to apply these same figures to the problem before us.

Let us suppose that the cam drum is 18 in. in diameter and that the fast speed will permit the drum to revolve once in 6 seconds. We would then have a circumference of practically 54 in. and a circumferential speed of 9 in. per second. The return of the turret would then be accomplished in a little less than one-quarter of a second. Even this seems to be too high for a machine of a size such as the one before us. In order not to do any further guessing, we must determine a safe speed for the return of the turret and we will assume this to be $\frac{1}{4}$ second. We will, therefore, have a circumferential speed of practically 4 in. per second. It should be noted that this return speed of the turret depends largely on the size and construction of the machine and attention should be given to the following rule:

It is better to select a return speed which is slightly too low than one which is slightly too high.

The effect of too high a return speed is excessive wear, danger of breakage, and tendency to loosen machine parts and spoil work. By reducing the estimated return speed from $\frac{1}{4}$ second to $\frac{1}{3}$, which is a speeding up of 50 per cent, we increase the momentum of the moving parts 125 per cent and we gain in time four times the difference between $\frac{1}{4}$ and $\frac{1}{3}$ of a second. Considering that the total time for our job is practically a minute and a half, a saving of $\frac{3}{4}$ of a second is such a small percentage of the total that it is not wise to take any risks to accomplish this small saving. When the total time for the complete cycle is very small, in other words, when the idle times form a large percentage of the total time, then it would be good policy to try to save every little part of the return and other idle movements.

Determining the Size of the Cam Drum

Having determined that the circumferential speed of the cam is 4 in. per second, we find now that we must allow an idle space on the cam of 4 in. for each index (because the index requires one second), 1 in. for the opening of the chuck, 1 in. for the closing, and 2 in. for the stock feed and also for the return of the feed shell. Thus the total length of the cam will be $30\frac{1}{2} + 4 \times 4 + 2 \times 1\frac{1}{4} + 2 \times 2\frac{1}{2}$ plus as much as may be required for the shifting of the two cam grooves of Fig. 175 and minus such parts of the cam as we may find can safely overlap each other. To determine this amount we lay out the diagram 176. In the space between the outer two concentric circles we place the length of cam required for the turret motion. In the next band, spaces required for the cross-slide motion; in the third, for indexing; in the fourth, for the open- and closing of the chuck; and in the fifth, for the stock feed; and we measure all of our distances on the outer circles.

In reality it makes very little difference what diameters we select for the outer circle, the cam drum, but if we select a very small diameter, say 6 in., the length required for the various spaces would make it necessary to go several times around the circle and, of course, this would be confusing. As we found in our preliminary considerations that an 18-in. drum is not very far from the correct size, we will select a size sufficiently greater than 18 in. to make sure that we do not have to go around more than once. The diagram of Fig. 176 is based on a diameter of 24 in.

We start the diagram at *A* and lay off a length *AB* required for the advance of the turret, and we do this by reducing the linear advance to the number of degrees required for such a length on a 24-in. circle. We then lay off *BC* which is the length required for the feed, and *CD* for the return of the first turret tool. Our schedule shows that the index follows, and we lay this

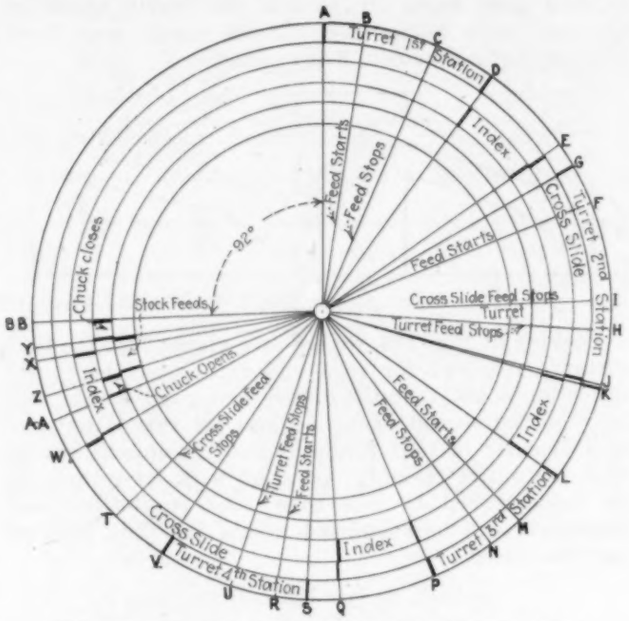


FIG. 176. CIRCULAR DIAGRAM OF TURRET AND CROSS SLIDE OPERATIONS

amount off on the outer circle, again reducing to degrees, but indicating the function on the third band. *DE* is the space required for this operation.

On the second turret operation, which, as we have seen, is combined with the forming operation of the cross slide, we will arrange matters in such a way that both tools start *feeding* at the same time. We have already seen that we would lose time unless we did so. As the advance of the cross-slide is greater than that for the turret tool, we lay off the distance *EF* for this advance and then we go back the distance *FG* for the advance of the turret tool. At the line *OF*, then, the feed starts for both tools. The length of time of feed for the turret tool is greater than that for the cross slide. *FH* represents this amount of time, whereas *FI* is the length of cam required for the cross feed. On the other hand, the return for the cross feed is longer than that for the turret and we lay out *IJ*, return for the cross feed, first; and *HK*, return for the turret, next.

Saving Time on the Indexing

Here we should call attention to the fact that it may very well be possible to start the index before the return of the cross slide is completed and it would be necessary to investigate this for every machine or every job for which we lay out the camming. If the swinging turret tools, while indexing, do not interfere with the retreating cross-slide tool, we can save some time or space, or both, on the cam by starting the index before the cross-feed tool has completely returned. As we are often cramped for space on a cam drum, such investigation should always be carefully made. In our case, which is imaginary, we have no data to make such an investigation and we will therefore start the index at

K. This index occupies the space from *K* to *L*. We go again through the regular performance of laying out the advance *LM*, the feed *MN*, and the return *NP*, after which we index once more from *P* to *Q*.

On the fourth turret position we have again the condition that the advance for the cross slide is greater than that for the turret, and once more we will arrange matters so that both tools start *feeding* at the same time. And so we lay out the distance *QR* for the advance of the cross slide, and then work back to *S*, at which point the advance begins for the turret. The feed for the cross slide takes place from *R* to *T*, whereas the feed for the turret ends at *U*. It would be possible to make the return of both tools stop at the same time, but this would mean that the return of the turret tool would be quite slow. Ordinarily this would be an advantage but as, in our case, this tool is a reamer, it is advisable to return it as quickly as possible; and so the movement of the turret would be completed at *V*, while the movement of the cross slide will end at *W*. Once more the index takes place from *W* to *X*.

Element of Time

Before laying off a new distance for a new function we should make it a point to see whether this new function can take place at the same time as the previous one. In this case there is no reason why the chuck could not open while the index takes place. Even the stock feed can take place at the same time, but as it might be possible that we want to stop the feed either against a turret tool or against a separate stop provided for that purpose, we will arrange matters so that the stock feed is completed some little time after the turret has indexed. We therefore select the point *Y*, slightly beyond *X*, for the end of the stock feed, turn back a distance *YZ*, and then a distance *ZAA* for the opening of the chuck.

Fig. 176 shows a distance *YBB* for the closing of the chuck which, of course, must take place after the stock has been fed out. It does not show a distance for the return of the feed shell and this is not necessary because this return can take place at any time during one of the other operations. We find, then, that 92 deg. of our circle are unoccupied, so that, if we want our diagram to conform to the cam drum, we must select a smaller diameter. This diameter would be $\frac{360 - 92}{360} \times 24 = 18$ in. approximately. This final diagram should be laid out because it will be the record for the cam construction and will give all the information later if changes in set-up are required. It is not shown here because it is not necessary for our purpose.

Other Facts Made Evident by Fig. 176

This diagram also tells us certain things to which we have not paid attention so far. It shows that the cam should run at high speed from *A* to *B*, slow from *B* to *C*, fast from *C* to *F*, slow from *F* to *H*, fast from *H* to *M*, slow from *M* to *N*, fast from *N* to *R*, slow from *R* to *T*, and fast again from *T* to *BB*. As *A* would occupy the same place as *BB* in the complete circle, we combine the first and last fast movement which then will be from *T* to *B*. If we make our diagram on paper in which the circle is divided into 360 deg. and if the disk on which we set the dogs for slow movement is also divided into degrees, we can make a fairly accurate initial setting of the dogs without any trial.

By doing some experimental work we can determine exactly the point at which the shifts from fast to slow and slow to fast take place for each dog and make a mark on that dog so that, when this mark is set on, let us say, line 35 of the dog disk, the trip from fast to slow or vice versa will actually take place at this point 85. This does not relieve us of the necessity of watching the dog carefully to see whether the trip takes place exactly at the point where we expected it, but it does do away with a great deal of guesswork and expedites the setting up of a job materially.

Reasons for Using Circular Diagram

It might seem that it would be just as easy, and perhaps somewhat easier, to lay out the final diagram on a set of parallel lines such as Fig. 170, and that the total length of such a diagram would then represent the circumference of the drum which we must use. This is true and the only reasons why the writer prefers the circular diagram are, in the first place, that it gives a better picture when the diagram is completed, and in the second place, that it is a somewhat safer method. It is often the case that some of the operations are accomplished not by a drum cam but by a disk cam or some other contrivance.

Such a mechanism must be laid out by itself and the result of such an investigation will naturally be the knowledge that it takes so many degrees of that other kind of cam for the operation. This number of degrees remains, then, the same whatever may be the diameter of our main cam. Let us say that in the schedule we examined we found that the indexing is done by a special cam which requires 30 deg. of the main cam for its completed function. We would have made every sector for the index a 30 deg. angle. If we had found that only 270 deg. of the total cam are occupied, we would then have reasoned as follows in order to obtain the actual size of cam required:

Clearance

We would have said that there are four indexes each of 30 deg. or 120 deg. altogether, which will leave 240 deg. for the other operations. In diagram 176 the index occupied a length of 4 in. or an angle of 19 deg., so that all the other operations occupied 268 — 76 = 192 deg. This number 192 would have been the same whatever space were required for the index, so that, if the individual indexings required 30 deg. each, there would have been a total of 120 + 192 = 312 deg. occupied in our diagram and 48 deg. would have been blank. The size of the drum would have been then $\frac{192}{240} \times 24 = 19.2$ in. Laying the diagram out with parallel straight lines would not have shown this relation and would easily lead to mistakes.

In order not to introduce more elements than are absolutely necessary, clearance was omitted in diagram 176. As a matter of fact there should be a small amount of clearance whenever we change from one function to another, for instance, between return of turret and index. This clearance may be in the form of an additional amount of return stroke and even if we should start the index a moment before this stroke is completed there would still be no danger of interference. It may also be done by starting the index a short distance after the completion of the return stroke.

The diagram also shows us that the fast speed of the cam must be such that a distance of 4 in for the index will be traveled in one second, from which the number of revolutions of the cam can be calculated. It further shows us that the distance *BC*, for instance, is traveled during the time the spindle makes 100 revolutions, or one-third of a minute. As we know the angle between the lines *CO* and *BO* we can calculate the number of turns per minute the cam should make on the slow speed end, if the slow speed of this is determined by change gears, we can set up at once for the proper speed. Before going further with some of the problems we will meet in laying out cams it will be well to look at the second element of a cam feed, namely, the roller.

Vacations With Pay

BY E. A. TERRELL

The following shows how we handle the vacation problem at our works: We have laid out a program of fifty working weeks of six days each per year. The remaining two weeks are devoted to vacations. One of these we arrange to include Christmas and the other to include the Fourth of July. At the present time we do not give vacations at any other periods of the year.

The details of the operation of the plan are simple. Each man in our shop works twenty minutes extra each day, making one hundred and twenty minutes or two hours overtime per week. At the end of the week we pay him for his regular time and place to his credit, in the savings account, the amount due him for overtime. This savings account we consider a reserve for vacation pay. At the end of twenty-five weeks we have placed to his credit, provided he has worked regularly, the total amount due him for fifty working hours. At the time the vacation is given we give him his regular pay envelope and in addition, withdraw from the reserve fund the amount due him for vacation pay.

On our books we charge the payroll account at the end of the week for the amount drawn to pay the current wages. In addition, we also charge the payroll, in a separate entry, with the amount due for vacation pay, crediting the individual accounts of the various workmen with the portion due each. A check is then drawn from our checking account for the total amount due on vacation pay. This check is deposited in the savings account "Reserve for Vacation Pay." By referring at any time to the individual accounts of the workmen we can tell exactly how much is due each of them, and in the event one of our men leaves us before the vacation period arrives, we can readily determine just what we owe him for his overtime and make an adjustment on a few moments' notice.

In the event that one of our workmen should be absent for a day or so during the week, we place to his account the same amount of vacation pay as though he had been present all week, deducting the time lost from his pay for the current week. This eliminates petty entries in connection with the system. We work exactly the same system in connection with the office and sales forces, everybody taking a vacation at the same time. We find that the plan works exceedingly well, requires no complicated accounting, and enables us to know just exactly how much time we will lose during the course of a year.

Drafting Room Efficiency—Discussion

BY H. S. KARTSHER

In his article entitled "Drafting Room Efficiency," published on page 302 of *American Machinist*, Mr. Sorentrue described a system for recording the results of checking which keeps the drawing comparatively free from defacement by the checker. There seems to be a diabolical craving on the part of the average checker to send the drawing back to the draftsman full of battle scars, presumably because the checker feels that the more errors he points out the better he is filling his job.

From the standpoint of the draftsman, however, the effect of such criticism is very discouraging. After he has taken pains to produce a neat, clean cut drawing, he experiences a certain feeling of personal injury when a strange pencil is used on his work, whether it is at the hands of the checker or because the "big boss" offers some "suggestions." Somewhat similar is the sensation when a new shine is stepped on in the street car, hardly a matter big enough to mention and yet the resentment is induced.

But to return to checking, there are two distinctly different methods used by large firms where there is a considerable amount of checking to be done. Both methods permit the checker to vent his feelings with the colored crayon, to scatter notes or criticisms around at will, and at the same time to keep the original drawing in exactly the same condition as when it left the draftsman's board. The first method is employed by firms who check after tracing. A rough, light blue print is made and two colored pencils are used, a yellow pencil for the check marks and a red pencil for the errors or points that require changing. The red crayon stands out and calls immediate attention to the offensive points.

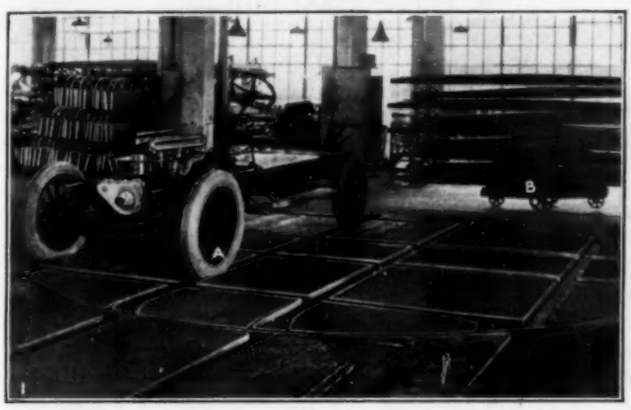
The second method is used by firms who check before tracing. The original drawing is tacked down on the checker's board and a piece of cheap tracing paper tacked over it. Two center lines fix the relative location and checking proceeds as usual. When the draftsman tacks the papers on his board for correction he leaves the two lower corners loose and, after locating the error, throws the tracing paper back and makes the correction. It will be seen that these two methods have all the advantages previously stated. The only disadvantage is the slight cost of the extra paper, which is negligible when compared with the time, labor and feelings saved.

Developing the Worker

BY R. GRIMSHAW

It is a poor non-commissioned army officer who cannot or does not make a soldier out of the greenest "rookie," and who, given men who have served one year, cannot turn them out better soldiers after another year's supervision, instruction and inspection. So with the "non-com" in the industrial army, Sergeant Foreman; he should develop his workers systematically and constantly, so that each month finds them more willing, more interested in the work, and more efficient.

That is why he was made foreman. That is why he was made foreman in the first place. The day when the ideal foreman was an autocratic bully has long since passed. The man for the job now is the thinker in the shop.



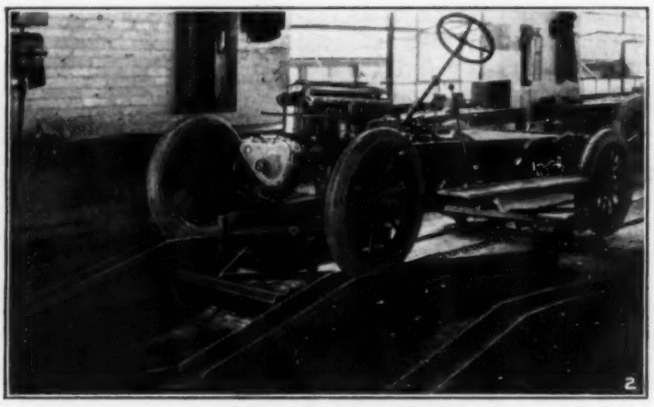


FIG. 1—INCLINE FOR RAISING AXLE FROM TRUCK. FIG. 2—DOUBLE TRACK TURNTABLE

Handling Methods in Automobile Assembly

Runways, Inclines and Turntables in the Franklin and Reo Plants—Conveyors and Other Devices Which Reduce Labor and Handling Time

BY FRED H. COLVIN
Editor, *American Machinist*

AS THE different units are assembled and an automobile nears completion, it becomes an increasing problem to handle the work rapidly and economically. The chain belt conveyor has become almost universal in automobile plants and there are many varieties of its application, a few of which, as used by Franklin and Reo, are shown herewith. After the wheels have been put on the axles, the Franklin is carried on small four wheeled trucks at each end, as seen at *A* and *B* in Fig. 1. These trucks are moved along on tracks sunk in the floor, by means of the chain shown between the tracks.

At the end of the runway is an inclined track, raised sides being provided to automatically keep the wheels in line. As the front wheels roll up this incline, the front truck is raised off the truck, and passes freely between the inclined tracks and also off the conveying chain. The rear truck continues to push the chassis until it too, is disengaged by the incline and the chassis is free to go to the next assembly department, while the trucks are returned to the beginning of the assembly line. The incline referred to is at the end of a long building and the next move starts the chassis across the end of the building. A turntable is provided, therefore, as shown in Fig. 2. The interesting feature of this turntable is the two tracks to accommodate both assembly lines at once when required.

Another assembly line is shown in Fig. 3. Here the motors, mounted on their temporary frames, go down the line on the left and are placed in position in their chassis which are on the next track. The motors are shown going down one track and the finished cars coming back on the other. The sequence of operations on these assembly tracks depends upon how many cars

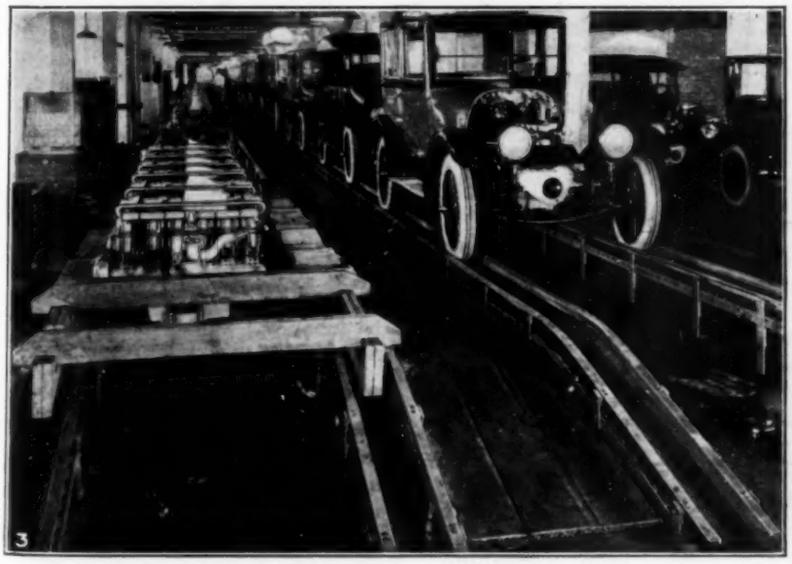


FIG. 3—ELEVATED ASSEMBLING TRACKS. FIG. 4—REO SPEED WAGON ASSEMBLY

are going through the shop per day. The exact routing and the use of the assembly tracks can be readily varied to suit different rates of production. These illustrations were taken before the new Series 10 motors began to go through the shop.

Figs. 4 and 5 are from the Reo plant, the first view showing a line of "speed wagon" chassis going down the assembly track. The conveying chain is very similar to that previously shown but it will be noted that only one rail is grooved, being found sufficient to keep the cars in line. The substantial overhead runway for

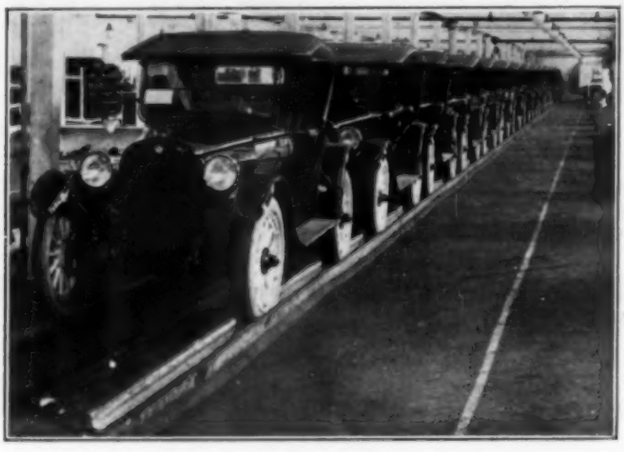


FIG. 5—READY TO LEAVE THE ASSEMBLING DEPARTMENT

hoists should also be noted. It enables a motor or other part to be easily handled either in or out of the car whenever necessary. The final end of a similar line of passenger cars is shown in Fig. 5. This view also shows clearly the single grooved rail, as well as the conveyor chain in the center.

A Shop Man's "Just Suppose"

(Written by a shopman after the style of our editorial feature of the same title.)

Just suppose you were a machinist and a member of a machinists' union, just an ordinary fellow, and you were out of work and applied for a job at a large plant where they needed machinists. Before being hired you were asked to sign a paper saying that you did not then belong to any union and that you had no intentions of joining one.

Nonsense, you say. Well, but—

Just suppose.

Or

Just suppose you were working in a shop and during the lunch hour you started talking to another member of your union on union ideals, not radical stuff, and the following day you were fired—with no reason given. You suspected that there was a private detective (?) in the shop employed by the firm to find out who the union men were. Or just suppose that you were this detective with a good job in the shop and about 20 or 30 dollars a week extra for writing just a little report each night on what took place in the shop that day. Don't you think you would be tempted to stuff your reports to make good on your job and continue to get the easy money?

Of course, this could not happen, but—

Just suppose.

Machine Shop Bulls—II

By Joe V. Romig

One day a little old man was brought into the shop by the employment clerk, for an interview with "Reds," our foreman. Reds looked him over thoroughly and started to shake his head negatively.

"Only a chance to make good is all I ask, mister," was his plea and Reds agreed to take him on giving him work on the lay-out plate.

When he started next morning Reds gave him a big sheaf of blueprints and showed him the pile of castings lying on the floor, which he was to lay out for the drill presses. Now it happened that Bill, the regular layer-out, was absent on a week's tear and had locked up all his tools and templets, leaving nothing as a help for his successor.

Reds, to his dismay, also saw the old boy take out of his inside coat pocket his one and only tool, an old three-joint, 2-ft. rule. Turning away he left the old layer-out to his fate, thinking he'd leave him alone long enough to get a stake and then bounce him at noon. Imagine his astonishment when, at 11:30 a.m. old man Williams, the new layer-out, came asking what was next in the work line.

Reds had planned his next move to be his dismissal, but was curious to see just how the old boy had worked him and so went along down to the lay-out plate to see his finished work. Here he found all the work neatly arranged, carefully and accurately laid out and done in less than half the usual time.

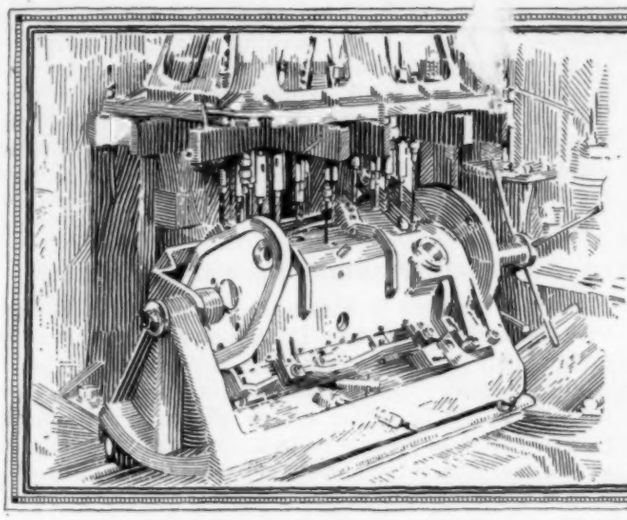
Reds could not help but marvel at the little old boy's work, and breaking away from his usual harsh manner, grabbed the old boy's hand and shook it heartily, saying, "Mr. Williams, I am glad to know you, and I sure am glad to see an old timer like you, make good in a shop so full of these wise looking, know nothing machinists, as I have here. Say," he continued, "they don't make our kind of machinists today, any more, the all-around kind I mean. All we get now-a-days is the damned specialist, etc."

Noticing that his new man had no lunch with him, and suspecting him to be in rather straightened circumstances, he handed him a dollar bill with the suggestion of a little lunch house down the street and a good dinner.

After he had eaten his own lunch he went down to the plate and was shown the improvised tools of the new man, by the admiring workmen who had watched the little old boy pull one over on the Boss. Small pieces of bent and pointed wires were his dividers, nails in Bill's trammel stick were his tram points, a broken tip of an old round file was his center punch, and last, he was shown the surface gage, which was a block, a stick and a nail, complete though simple in its entirety.

Williams worked out the balance of the week, the boys all loaning him tools, which he used at their suggestion and always was sure to thank them for when returning them. When pay day came he shyly asked Reds for all of his money, explaining that he must now be on his way, and thanking Reds for the stake which he had been so kind to give him, and wishing him good luck in the bargain.

Reds regretfully complied with the old boy's request, but they parted as life long friends, these two old-timer, all-around mechanics. And it can be said right here, "They don't make any of our kind any more, only specialists," is pretty nearly the truth.



Tool Engineering

By

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Dowd Engineering Company, New York City

Progressive Blanking Dies—Laying Out to Avoid Waste of Stock—Bending Dies—Importance of Grain—Relation of Blanking and Bending Dies

WE HAVE discussed plain blanking dies in the previous articles. In this type of die a simple blank is cut out and nothing else done, yet it is often desirable to punch or slot the blank. This last is frequently done by combination of two or more operations in the same die, which is called a progressive blanking die. Such a die differs from a plain blanking die in that a hole or slot is punched out of the stock before the blank is produced, after which the operation of blanking is done in the same manner as previously described. It is called a progressive die because the hole and the slot are made in progressive order. A system of this sort is used for a great variety of work.

In designing a progressive die there are several points which must be carefully considered.

(1) Thickness of stock. This affects the length of the punches used and their spacing. The arrangement should be made so that the blanking punches strike the work before the piercing punches do, in order to relieve the pressure on the machine and make the cutting action easier. A pilot must be arranged on the blanking punch in order to locate the work accurately. The distance between the ends of the blanking and piercing punches should be equal to the thickness of the stock.

(2) Layout of blank. The method of laying out a blank for a progressive die is similar to that used for blanking dies. The space allowed between blanks and around them is governed by the thickness of the metal which is being punched. The arrangement on the strip should be such as to economize and get as many blanks out of a strip of stock as possible. The piercing and blanking punches should be set well apart in order that there will be plenty of metal in the die, so that it will not tend to break away and will be strong enough to resist the pressures applied.

(3) Spacing of punches. When there are a great number of holes close together in a given piece of work this condition often makes it necessary to use several progressive operations in order that the punches shall not be set too close together. It is not generally advisable to have more than three steps in the progression in order that the die may not be too long. It is often possible to build progressive dies in sectional form in order to make the machining operations easier. Also, the up-keep is somewhat better in case of accident or breakage.

In Fig. 467 is shown an example of this type of die for producing the washer shown at *A*. A diagram which illustrates the method of laying out the stock and which shows the order in which the operations are performed is shown at *B*. The hole is first produced at *C*, and after this the blank is cut out at *D* as the stock is fed through the die. The layout of the stock for progressive dies is very similar to those previously described under the head of blanking dies. The distance between blanks, as indicated at *E*, is the relation between the two holes produced. The distance around the blank is equal to the thickness of the stock, and the amount of stock between blanks is in the same proportion.

We have mentioned the importance of the length of punches in relation to the thickness of the blank which is being produced. The punch shown at *F* for producing the hole and the punch *G* used for blanking do not

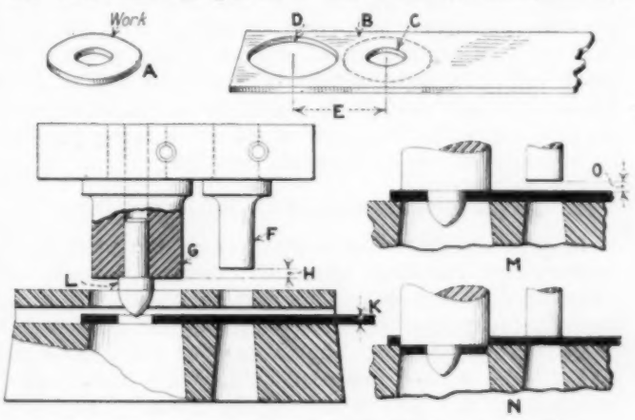


FIG. 467—PRINCIPLES OF PROGRESSIVE DIES

enter the work at the same time but are spaced a distance apart as shown at *H*. This dimension is generally made equal to the thickness of the stock *K* for blanking dies for ⅛ to ¼-in. stock. This gives the blanking punch time to go through the stock before the piercing punch strikes it, thus relieving the amount of pressure re-

quired on the press and also making it easier for the die.

The punch *G* is fitted with a pilot *L* which enters the previously punched hole in the stock, thus centering it before it is blanked. This prevents any inaccuracies which might result from an improper method of stopping the stock. The pilot is provided with a round nose

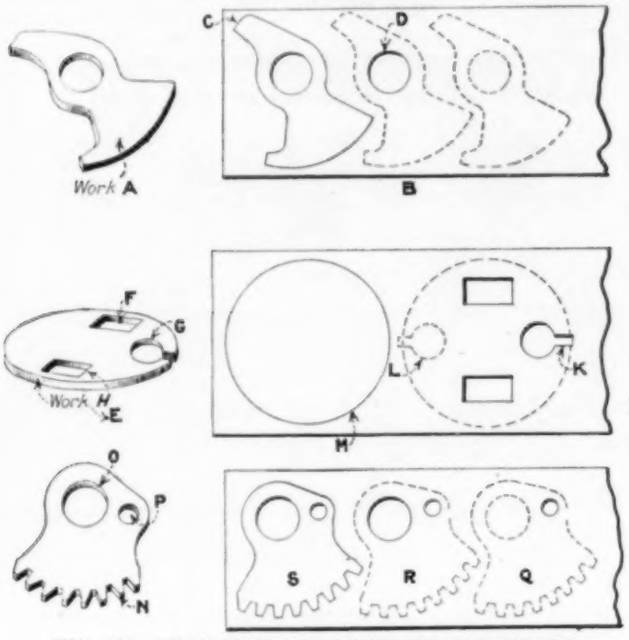


FIG. 468—EXAMPLES OF PROGRESSIVE LAYOUTS

as shown and its action is evident. The hole in the punch *G* into which the pilot fits extends entirely through the punch. This is done so that the pilot may be knocked out and replaced when necessary. The diagram at *M* shows the action of this type of die very clearly, the blanking punch having just come down on the stock and the pilot having centered the work by entering the hole previously made. The piercing punch still remains above the stock a distance *O* equal to the thickness of the stock.

In the diagram at *N* the action is shown after the blanking punch has produced the blank, which is being carried down through the die. At this time the small piercing punch has just come in contact with the work and its further movement will evidently produce the small hole. It is important in designing a pilot for a blanking punch that there should be a straight section on it equal to the thickness of the stock being punched, in order to insure an accurate location.

Layouts for Progressive Blanking Dies

In order to show the application of the principle to progressive blanking operation, several layouts are illustrated in Fig. 468. The part shown at *A* is a lock segment, a number of which are required in a certain piece of mechanism. The layout for stock is shown at *B*. The hole is produced at *D*, while the blank is punched at *C*. The layout of the blank is such that the greatest economy of stock can be made.

In the example *E* a piece of somewhat different shape is shown having various holes and slots at *F*, *G* and *H* as indicated. The hole *G*, it may be noted, runs out to the edge of the stock, and it is customary in a case of this kind to extend the punch a trifle beyond the blank diameter as shown at *K*, in order that a clean edge will be made. This is an example which illustrates the importance of having the die openings as far apart as possible. If the opening *K* were to be placed as shown by the dotted lines at *L*, the opening between this hole and the blank diameter *M* would be so close that the amount of stock in the die between the holes would not be heavy enough to withstand the pressure when blanking. This point is very important and the designer should always bear it in mind when making a layout.

Progressive Blanking for a Gear Segment

Another segment is shown at *N*, and it can be seen that there is a large hole *O* and a small hole *P* to be produced in it. These holes are close together, but it is not advisable to locate the punches in the same manner. It would be better to use one more step in the progression and make the two piercing operations as shown at *Q* and *R*. The small hole is first punched at *Q*, and then as the stock is fed along the large hole is pierced at *R*, after which the finished blank is produced at *S*. It is occasionally necessary to design a progressive die with as many as four steps in it, although it is advisable to group the punches in such a way that not more than three steps will be required. This point has been mentioned previously.

Among the examples of plain blanking dies several

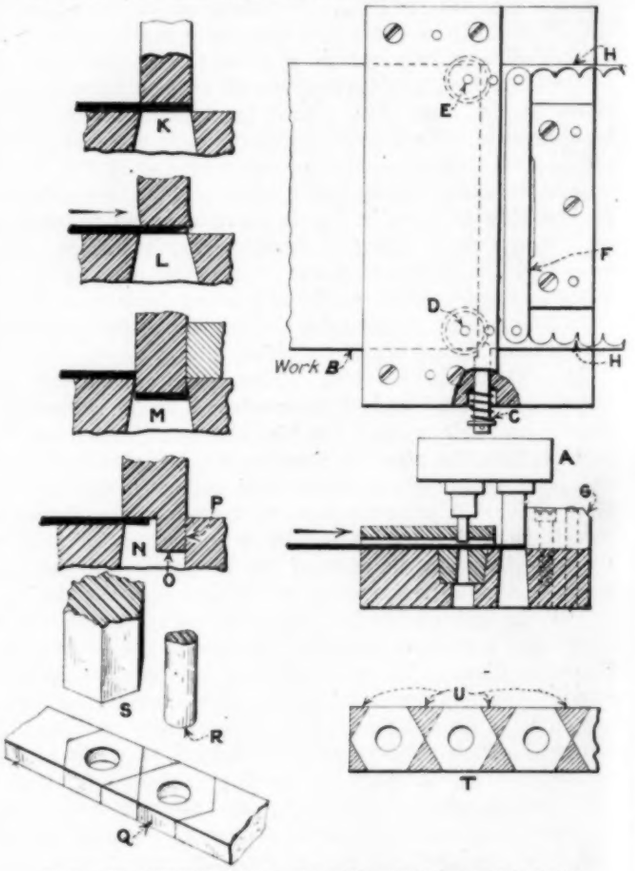


FIG. 469—PRINCIPLES OF DIE DESIGN, SHOWING METHODS USED TO AVOID WASTE OF STOCK

were given in which no allowance of metal between blanks or around the edges was necessary. So also in progressive dies the same conditions are occasionally found. For example, the edge of the stock may be used as the side of the blank, or the blanks themselves may be cut off so that no metal is allowed between the parts. Fig. 469 shows two examples of this kind At

A is shown a progressive blanking die for stamping hacksaw blades. The stock *B* is fed into the die through the stripper as shown. It is pushed forward by hand and located in its starting position by means of a starting finger *C*. This finger is more in the nature of a temporary stop which is used only when placing a new strip of stock in position, and the proper starting relation is required with the edge of the stock. By pushing the finger forward the location is obtained for the first operation, and after the pressure is released the spring forces the stop out of the way so that the stock can pass by this point.

Stamping Out Hacksaw Blades

The first operation in this die is the piercing of the two holes at *D* and *E*. In the proper positions in the die so that they will come directly under the punches, two small piercing dies are inserted. The purpose of this construction is to permit easy removal for replacement purposes. It will be seen that the positions of these piercing punches is such that one blank is skipped when first setting up the work. This is done in order to avoid bringing the piercing punches too close to the edge of the die.

The stock is fed forward after punching until it stops against the surface *F* on the block *G*. As the punch is carried down, the blank is formed and passes through the die in the usual manner. In this example only one side of the punch is guided in the die, so that it is necessary to back up the other side in the manner shown by means of the block *G*. This is clearly indicated in the sectional view. This method prevents the punch from springing out of place as it might do if the cutting action were all on one side of the punch. This condition is illustrated graphically in several examples.

At *K* the punch has just struck the work and forced it down on the die. At *L* the pressure is applied, and

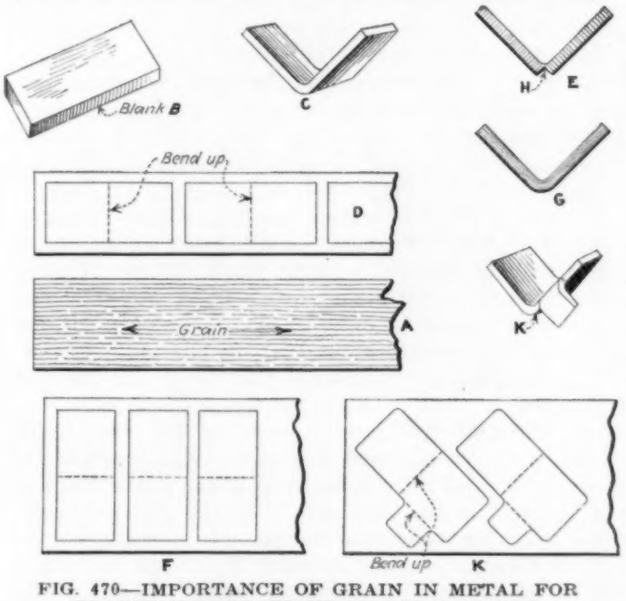


FIG. 470—IMPORTANCE OF GRAIN IN METAL FOR BLANKING OPERATIONS BEFORE BENDING

as the action is all on one side, the punch springs over in the direction indicated by the arrow. In order to avoid this action a hardened block may be placed as shown at *M*. This block is so arranged that it takes the thrust resulting from the action of the punch only on one side of the work. There are some cases when it is necessary to design a special punch like that shown at *N*. Here the punch enters the die and the heel *O* bears against the back of the die at *P*. Then as the punch proceeds down in the work, this portion acts as a guide so that there is no chance for spring in the punch.

A layout of stock for blanking hexagon nuts is shown

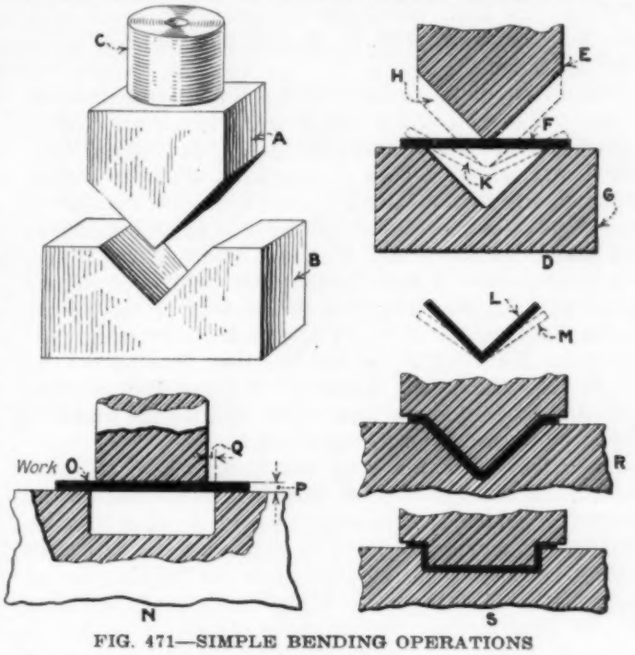


FIG. 471—SIMPLE BENDING OPERATIONS

at *Q*. The edges of the stock are used [illegible] sides [illegible]ts, and the [illegible]

Occasionally the shape of the work is such that an excellent layout may be made if the blank is turned at a 45-deg. angle like that shown at *K*. This is sometimes possible, and it has been found that a 45-deg. angle bend will seldom break unless the material is very fragile. An angle of 45 deg., however, seems to be about the limit at which the work can be turned, and it is not desirable to exceed this amount when making a layout.

Several simple diagrams of bending operations are shown in Fig. 471. At *A* and *B* are shown, respectively, a punch and die for bending the part *C* previously illustrated in Fig. 470. Dies of this kind are very simple in their construction and do not require very accurate workmanship while fitting. The die is usually mounted in a cast-iron shoe held on the bolster of the press, while the punch is held in the ram by means of the shank C. The diagram at *D* illustrates the method of bending a piece of work. The punch *E* comes in contact with the work *F*, which has been located on the die *G*. As the punch descends it takes the position indicated by the dotted lines at *H*, so that the blank is forced up on each end as shown at *K*.

When bends of this kind are being made, there is usually a certain amount of spring in the material, the amount of which is dependent to a great extent on its quality. If a piece is to be bent to 90 deg., as shown at *L*, it is likely to spring back after the bending operation until it takes the position shown by the dotted lines [illegible] is advisable, therefore, in designing a die of [illegible] provide for such a contingency by decreas- [illegible] which is usually determined [illegible]

an inch in order to compensate for variations in the thickness of the stock.

The punch and die shown at *R* are used for punching a U-shaped piece having two straight edges on the top. This is similar to the example illustrated at *A* except for the straight edges. Here also it would be necessary to make an allowance for the spring of the material. In the example *S* a punch and die are shown for a U-shaped piece of similar style having straight corners. These examples are given in order to illustrate the number of bends which can be made at one time in a bending die.

It is difficult to approximate the straight length of a blank required for a bending operation. The exact size cannot be determined by means of a formula. For this reason the bending die is usually made first, and after the correct length has been determined the blanking die is made to suit.

Rules for approximating the length of blanks required when bending operations are necessary are given in Fig. 472. The formulas given will serve very well for laying out blanking dies when a bending operation is also used. The exact size can be gotten only by obtaining a blank of proper length as determined by the bending die, and using this piece as a guide for the blanking operation.

How Do You Figure the Cost of Tool Work in the Shop?

BY A. W. FORBES

[illegible]e hear frequent statements that it costs more to [illegible]ool work in the shop than to send it outside. Also [illegible] encounter statements to the contrary. When the [illegible] work is done by men particularly hired for the [illegible]pose it is a simple matter to figure the cost, but in [illegible] case it is not so easy. No one is engaged here for [illegible] work but most of the tools, with the exception of [illegible]e regularly carried in stock by the dealers, are [illegible]e by the regular production force.

[illegible] is necessary to have a production force sufficient [illegible]andle orders as they come in, especially as a large [illegible] of our product is special machines made for par- [illegible]lar jobs. They are usually wanted in a hurry. This [illegible]es frequent periods without work. Some of this [illegible]e can be spent in making stock parts, but they re- [illegible]'e a considerable amount of material and so tie up [illegible]'e capital in purchases than is desired. As a matter [illegible]fact, we spend a considerable portion of this time in [illegible] making.

[illegible]low how shall we figure the cost of this time? If [illegible] men were not engaged in tool making, it would be [illegible]essary to send them home, which has many bad ef- [illegible]s because, in the long run, it is the pay per week [illegible]her than per hour that counts. In some cases, it [illegible]ght be necessary to pay as much for the 30 hours per [illegible]k actually worked as for a full week. It is reason- [illegible]e, therefore, to claim that all the time should be [illegible]rged against the production jobs and tool making [illegible]ared at no labor cost.

[illegible]Most of us, however, would not go so far as this. [illegible]t, in a case like this shop, I do not think that it is [illegible]sonable to charge even the full wages paid to the [illegible] work, while the production work should bear the [illegible] amount of overhead and a little also for waiting [illegible]e which the tool making utilizes.

Ideas from Practical Men

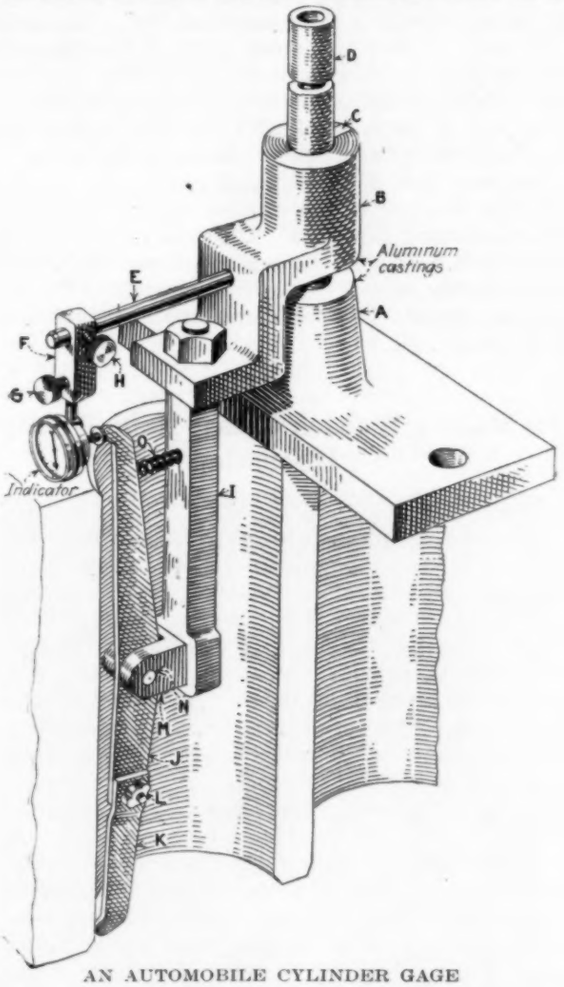
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

A Cylinder Gage

BY H. A. PETERS

The testing fixture or gage shown here is used for testing the perpendicular trueness of the bores of an automobile cylinder block. Any variation in this respect of the bores would mean either the wearing down of the piston bosses, the wearing of the piston pin bearings or the cylinder bores.

Referring to the diagram, the aluminum base of the gage *A* has a hardened and ground standard *D* pressed into it. This standard *D* is hollowed out to lighten it, as shown, and has a keyway running its full length.



AN AUTOMOBILE CYLINDER GAGE

Aluminum slide *B* is made a slip fit on standard *D* and is kept from turning by key *C*. Piece *I* is bolted tight in slide *B* at one end and has a forked piece *M* pressed into it at the other. This forked piece *M* holds gage arm *J* and allows it to pivot on pin *N*. To allow for adjustment the gage arm *J* is made of two segments, *J* and *K*, which are clamped together by means of the nut *L*. At the indicator end of arm *J* a tension spring *O* holds the arm in tension.

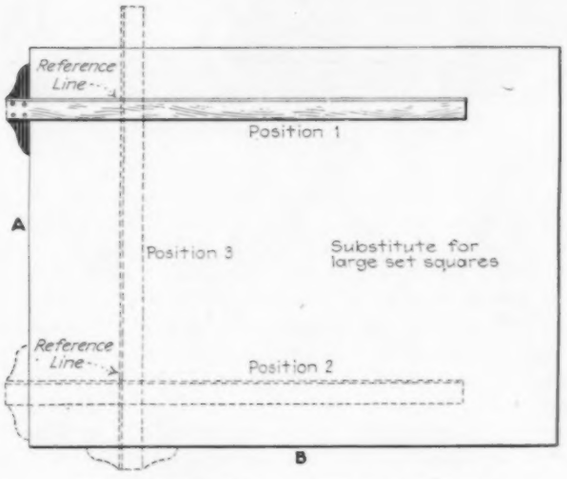
Block *F*, which holds the indicator in place with thumb screw *G*, is a slip fit on rod *E* and can be locked in position by means of thumb-screw *H*. To operate the gage, the base *A* is clamped to the cylinder block in a suitable position, the smaller gage arm *K* is then adjusted until it bears against the cylinder bore while the other end *J* bears against the indicator as the diagram shows. Variations of 0.0005 deg. can be ascertained by this gage.

A Drafting Room Kink—Discussion

BY W. ROLAND NEEDHAM
Goodmayes, England

Referring to the article under the above title by Edward Heller which appeared on page 972, Vol. 56, of the *American Machinist*, it has occurred to the writer that those who do not possess or do not care to go to the trouble of making the little device described by Mr. Heller can secure reasonably accurate results without it.

For less frequent use than is contemplated in the original suggestion the alternative as per the accompanying sketch may be preferable.



SUBSTITUTE FOR LARGE TRIANGLES

With the T-square in position 1, mark where required a short line which crosses the junction between bevel edge of square and paper. Thus, as is indicated in the figure, part of the line is on the square and part on the paper. Now move square to position 2 and mark the paper by reference to the line on the square bevel. Then as shown by position 3, join the markings on the paper.

Of course, in case the edge *B* of the board, as well as that at *A* is finished true, and each is truly square with the other, even this simplification is unnecessary.

Old Lathe at the Bennington Machine Works

By Milton Wright

An interesting old lathe that dates from the period before the Civil War is shown in the accompanying photographs. It is an excellent example of home product, made at a time when the wits of the "old man" were often matched against market and transportation difficulties as well as the regular shop problems. Some time in the 40's the late Olin Scott established at Bennington, Vermont, a machine shop and foundry to do general jobbing and build machinery for the paper mills to be found in that section of New England. Though the founder has long since passed away the shop is still doing business in the original buildings under the name of the Bennington Machine Works.

As first established, the limit of capacity of the shop was represented by a lathe that would swing at most but about 42 inches and the proprietor soon found that this was too small to handle the large wheels and cylinders that came his way. He, therefore, set about building a bigger one from materials already at hand. Structural steel shapes were not then as readily available as they are now, so the foundry was called upon to furnish cast-

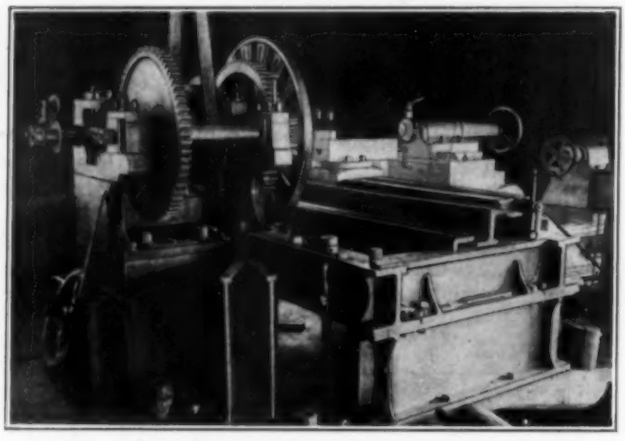


FIG. 1—HEADSTOCK OF HOME-MADE GAP LATHE

ings with which to build up the machine. Size was no barrier in the foundry. Most of the large molding was done "in the floor" and if the floor was not big enough there was all out doors available. The skill of the old time molder enabled him to make most any ordinary kind of a casting, including gears, without much in the way of patterns.

A bed plate upon which to build the head-stock was first cast. This was set in place on a solid foundation at the end of, and in line with, the bed of the smaller lathe before mentioned, but not attached to it. The head-stock was built up from this plate with the spindle parallel to, but considerably above, the spindle of the other lathe. The "carriage" consists of a slide-rest mounted upon suitable angle castings bolted to the bed plate and these castings can be arranged in any position desired by changing the bolts. The slide-rest is operated by a screw and has a cross travel the entire width of the lathe. The longitudinal travel is limited to the length of the slide, which is about twelve inches, and if longer cuts are required parallel to the spindle the rest must be reset.

A view of the head-stock is shown in Fig. 1, which also shows the manner of mounting the slide-rest. In Fig. 2 may be seen the entire lathe, showing how the tailstock

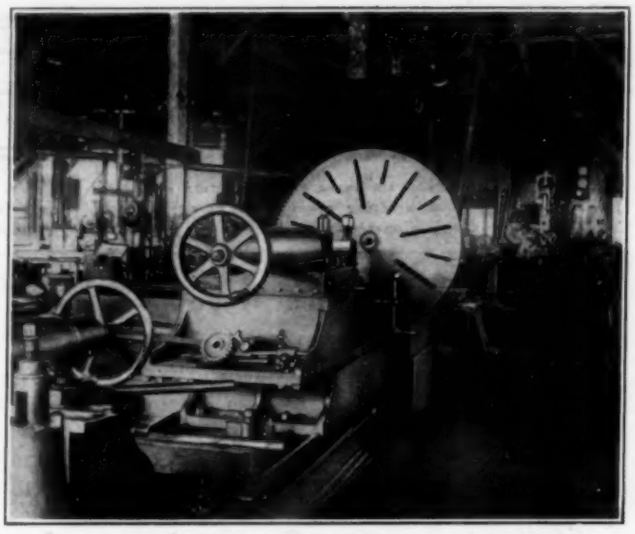


FIG. 2—VIEW OF LATHE FROM TAILSTOCK END

is mounted on the bed of the smaller lathe. The tailstock has two main parts, one sliding upon the shears of the smaller lathe and the other one fitted to it. To turn long work upon centers the upper part of the tailstock is removed and the headstock of the smaller lathe raised upon raising blocks to line with the large spindle. The lower part of the tailstock with the slide resting upon it thus becomes the carriage of the combined lathe.

The lower part of the tailstock may be run out to project over the end of the smaller bed if desired, much like an ordinary gap lathe. The capacity of the lathe is about 7½ ft. swing in the gap and about 16 ft. between centers when used for smaller diameters. The record job was a fly wheel 7 ft. in diameter and weighing about 5,000 pounds.

To Make a Wooden Chuck Hold Tightly—Discussion

By M. E. Duggan

Referring to an article under the above title by Charles G. Spicer, page 419 Vol. 57 of the *American Machinist*, Mr. Spicer's method for reverse chucking is new to me. "There is," he says "no better method for this purpose than the one here described." As to this I can hardly agree with him, in fact "no better method" does not fit in when describing the things done in the pattern shop, foundry, core room, or machine shop. Pattern makers in general, however, will welcome any method or device that will make easy the reverse chucking of small pieces or patterns in the wood turning lathe.

"Take a piece of wood of suitable size and fasten it to the faceplate," suggests Mr. Spicer. Right-here he knocks the whole job into a cocked hat. What is wanted is a "something" or a "method" that will eliminate this piece of wood because, in many instances, it takes a longer time to find the piece of suitable size, cut it on the band saw, fasten it to the iron face plate in the lathe and turn it to the required shape and dimensions, than the time required to turn and shape the piece itself.

The little iron face plate with its tapering shank to fit the hole in the lathe spindle, and with the "hole" and "counter-sink" in the center to receive an ordinary

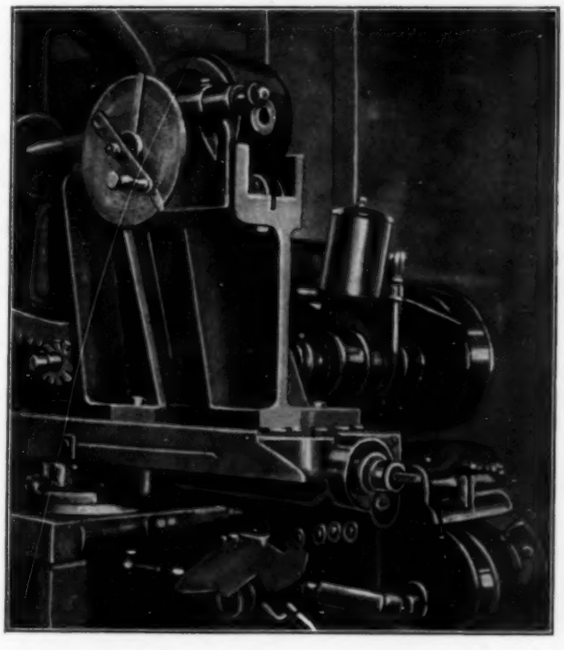
every-day-woodscrew, is part of the equipment of the wood turning lathe installed in every pattern shop. Now, with this little chuck I can turn and reverse chuck a piece about 14 in. diameter by 3 in. thick. But to do this I generally use my own outfit, because the tapering shank is a correct fit in the hole in the lathe spindle; the screw, a No. 16, is a press fit and true in the center hole in the face plate; and the threaded end projects 1¼ in. beyond the face plate. This No. 16 screw will grip and hold the wood equally as strong as two smaller wood screws.

The chucking is done in the following way: If the piece to be turned is 1¼ in. or less in thickness, I drill a ⅜-in. hole half way through the piece. I put a backing collar of wood on the screw and face this off until the screw protrudes—say ⅜ in. for a piece 1¼ in. in thickness. The piece to be turned is mounted on the screw, turned, and finished. Now comes the reverse chucking. A hole is drilled in the finished piece in the following way: A center is made in the turned piece by bringing the tail center against the wood. A ⅜-in. hole, which is the diameter of the screw at the bottom of the thread, is drilled in the center of the piece. The piece is then taken off the screw and reverse chucked, on the ⅜-in. hole. If the work is done in a mechanical way the piece should run true.

Cutting Large Gears in a Small Milling Machine

BY W. C. SCHELLENBERGER

We recently had occasion in our shop to convert a number of power presses from belt to motor drive and the way we did it was to cut teeth in the periphery of each fly-wheel and drive direct from the motor shaft. There were 9 of the wheels in all and they ranged in diameter from 24 in. to 36¾ in. in outside diameter with teeth from 176-6 pitch to 143-4 pitch. The largest wheel weighed over 700 lb. As the largest wheel was the greatest problem we figured upon this one first and made our plans accordingly.



CUTTING A LARGE GEAR ON A SMALL MILLING MACHINE

The only machine available in the shop for the work was a No. 2 LeBlond milling machine, which we rigged up to cut the teeth from the under side of the wheel, as shown in the illustration. We made two pedestals to support the wheels in bearings, seeing to it that they were high enough to swing the largest wheel and leave sufficient space beneath it for the cutter. A third pedestal was made to support the dividing head. The two main pedestals took all the weight and the thrust of cutting so as to relieve the dividing head of all duty except that of spacing.

As practically all of the wheels required an odd number of teeth for which there was no index plate available, we were obliged to make up special plates in advance. Though the job required a deal of rigging up, the actual time of cutting was a surprise. With a spindle speed of 35 r.p.m. and a table feed of $\frac{1}{32}$ in. per rev. we were able to run a cut over the width of the wheel in 2½ minutes. The entire time of cutting the largest wheel was but 7½ hours.

Safety Gate for Railroad Crossing

BY J. BAINTER

At the plant of the Cincinnati Planer Co. in Oakley, Cincinnati, Ohio, a railroad siding that comes in from the front of the plant runs parallel to and quite close to the side wall on its way to the unloading platform at the rear of the building. In this wall there is a door through which the truckmen most frequently pass on their way to a storage yard for castings. Since a truckman coming out of the shop cannot see up or down the railroad track until he has actually passed the door, there is always present the danger of accident from locomotives or cars that are being switched into the siding.

GATE FOR GUARDING RAILROAD CROSSING ON A SIDING AT THE CINCINNATI PLANER CO.

To protect the workman, a safety gate was made which would automatically guard him from harm. As can be seen in the accompanying illustration, the gate is simple enough. It is mounted on a post at the side of the door toward the front of the shop, and consists chiefly of a long bar that extends entirely across the railroad track. The outer end of the bar is normally supported on another post and rests in a V, from which it can be readily pushed.

When a car is backed into the siding, it comes from

the right and strikes the extended bar so as to push the gate shut. Should a truckman be coming out of the door just at that time, he is merely pushed back and held by the gate from walking further and on to the track. Since there is plenty of room so that he is not pinched between the gate and wall, there is but little danger of injury to him, such as would certainly occur if he walked directly in the path of the moving car.

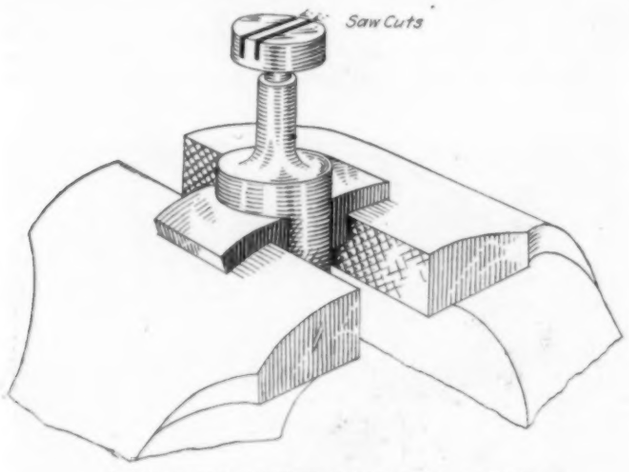
The gate stays in its closed position until the locomotive has spotted the car at the platform and left the siding. It is then placed in the open position, so as to be ready for the return of the locomotive for removing the car or bringing another car. The gate has been quite satisfactory, and it has given a considerable feeling of safety to the men that must use the exit on the railroad tracks.

Machining Woodruff Keys

By R. McHenry

In a jobbing shop it is often necessary to make one or more Woodruff keys. The job may require them to be of bronze, machine steel, tool steel or other material and perhaps of greater or less than standard thickness. In any case, I find machining them in a lathe to be the most satisfactory method.

First, a piece of round stock, slightly larger in diameter than twice the raidus of the key to be made, should be chucked so that an inch or so will project from the chuck jaws. The stock should then be turned to a diameter equalling twice the radius of the key, or in other words to the diameter of the keyway cutter. Next



MAKING WOODRUFF KEYS IN A LATHE

make a deep groove with a parting tool at a distance from the end of the stock slightly more than the thickness of the finished key.

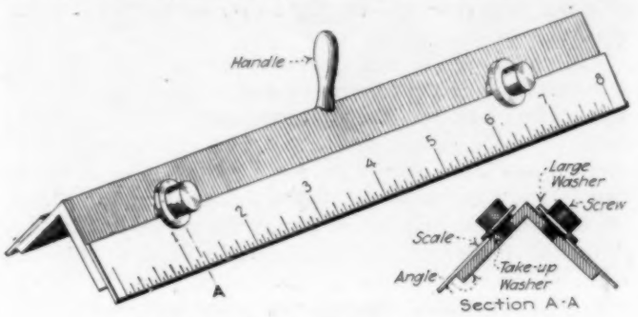
More cuts are now taken until the rod is necked out, as shown in the sketch, leaving sufficient room for the anvil of a micrometer. The inner side is carefully faced off smooth with a side tool and the disk is then reduced to thickness by facing the outer end of the stock, measuring the thickness with the micrometer.

After chamfering the edges of the disk with a fine file, the stock is removed from the chuck and held upright in a vise. Two hacksaw cuts parallel to the axis of the stock will now produce two finished keys that need only a trifle of burring with a file to be ready for service.

Novel Scale Holder

By P. A. Daschke

Designers and others engaged in laying out accurate work find it advantageous to have a number of variously graduated scales on hand. By means of the holder here shown scales of different graduations can readily be held, the holder thus forming a triangular scale rule in itself. In this way the graduated sides are brought



HOLDER FOR DRAFTSMEN'S SCALES

close to the work; a distinct advantage in laying out accurate measurements. As the scales become worn, new ones can easily be inserted or replaced with others of different graduations.

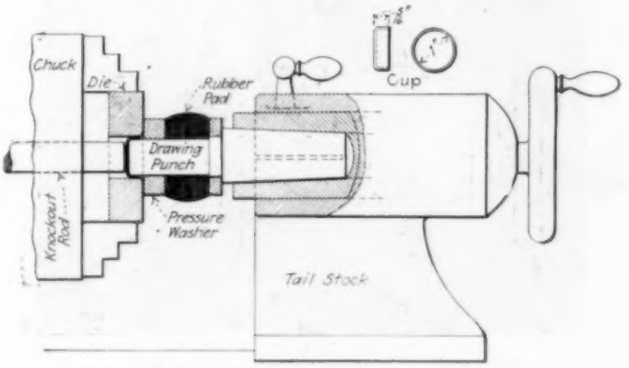
Procure any suitable metal angle, tap it on each side for two small machine screws so that the scale projects a trifle beyond the leg of the angle. Provide two small take-up washers the thickness of the scale, two large clamping washers and two round or knurled head machine screws for each side of angle. By this method of fastening the scales do not become mutilated. A small stock handle may be placed in center of holder to facilitate handling.

A Drawing Job in a Lathe

By S. A. McDonald

In a small jobbing shop, which did not include a punch press in its equipment, a lathe hand constructed the lathe die, illustrated in the sketch, to draw up some cups from 0.0312 in. brass, 1 in. in diameter by $\frac{1}{16}$ in. deep.

He first turned up a piece of cold rolled steel to fit the tailstock of his lathe and the other end he turned to the diameter of the inside of the cup. Two washers were then turned up, one a driving fit on the punch and the other a sliding fit with one face polished to act as a pressure ring. Out of some sheet rubber he made the pressure pad. Next he chucked a piece of cast iron,



DRAWING SHELLS IN THE LATHE

faced one side and bored a hole to the outside diameter of the cup, rounded the corner, made a circle on the face for locating the blank and gave the face and hole a high polish. His punch and die were now ready for work.

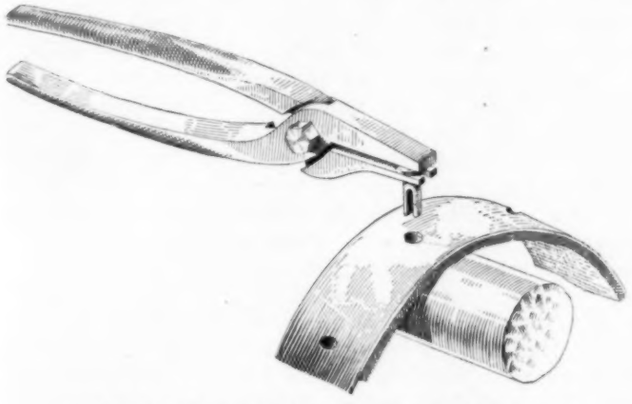
By locking the spindle with the back gears and clamping the tailstock, he converted his lathe into a screw press. The size of blank was determined by trial and was cut out with shears. Locating the blank by the scribed circle, the tailstock was screwed out so that the pressure washer gripped the blank, compressing the rubber pad until the punch drew the blank into the die. On withdrawing the punch the rubber pad stripped the cup from the punch and, by using a knockout bar through the lathe spindle, the cup was knocked out of the die.

The boss was so pleased with the results that he had the lathe hand make up a blanking die in the same way. The remarkable thing about the whole job was that the lathe that made the cups was the only tool used in making the die.

Tool for Holding Split Rivets

BY G. A. LUERS

Where a great many split rivets are used, as in the relining of brake bands, the tool shown in the accompanying sketch will prove of great value as a time economist and will also save the temper of the workman by eliminating the bruised fingers which are bound



PLIER FOR SETTING RIVETS IN BRAKE BANDS

to ensue if he tries to hold the rivets in the ordinary way while starting them into the band with his hammer.

The tool is made from an ordinary pair of flat-nosed pliers by grinding down one jaw to about $\frac{1}{16}$ in. in thickness and then filing a slot in the thin jaw to take the body of the rivet. The rivet is then grasped as shown and started in the hole by striking the heavy jaw of the pliers directly over the head of the rivet. The tool is of equal advantage in the upholstering department for setting upholstery nails.

Soliloquies of Old Mac

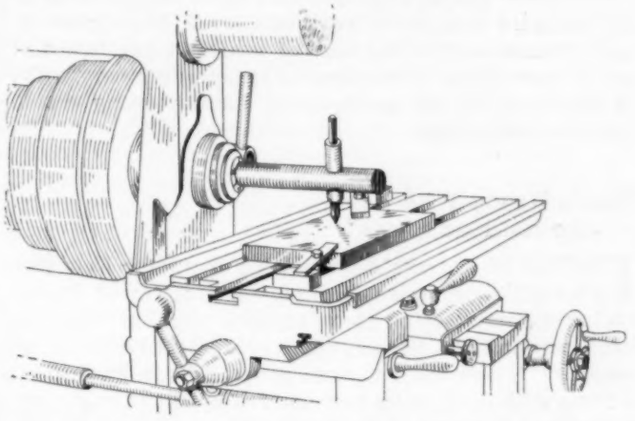
Turpentine is the best lubricant to use on a drill when drilling holes in flat springs or similar pieces of hard steel. Take a shallow pan (the cover of a tin can is convenient) fill it with turpentine and lay the work in it. You can then drill through the whole business and throw the cover away.

Handy Laying Out Tool

BY JOSEPH COLE

A very satisfactory method of laying out flat work is to clamp it to the table of a milling machine where it can be moved in either direction by operating the feed screws. It is necessary, of course, to provide means for holding the prick punch in a fixed position while moving the work. The accompanying illustration shows a simple tool made by the writer for holding a prick punch for laying off dies on a milling machine table.

The tool consists of a piece of tool steel turned on one end to fit the collet of the milling machine and at the



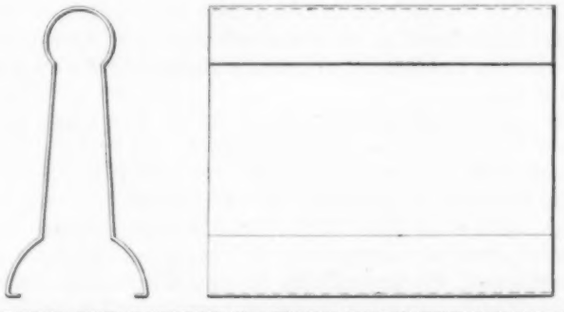
LAYING OFF WORK ON THE MILLING MACHINE

other end it has a hole bored at right angles to its length. Into this hole is driven a ground and lapped bushing, holding a sliding prick punch. The use of this tool is obvious to those who could use it. The sketch tells the rest.

Device for Handling Small Work on Milling Machine

BY R. A. FOLLENSBY

The sketch shows a device made by the assistant foreman of a milling department for the purpose of picking up thin pieces from the vise of the milling machine. When these are covered with chips and oil they are quite difficult to get hold of with the fingers and, though this tool is very simple and may be made in a few minutes' time, it increased production on the job by



DEVICE FOR PICKING UP WORK FROM THE MILLING MACHINE VISE

about 10 per cent because of the ease of handling. A description of the device is unnecessary. It is made of thin spring steel and the shape should be made, of course, to fit the job in hand.

Editorial

TO KEEP an employee when he has become too old or feeble to be really useful shows human sympathy. To keep a machine when it is old or out of date shows lack of business sense. On the other hand, nobody would think of throwing a good machine into the discard because it has slipped a cog or caused some other kind of trouble, while firing a man because there is temporarily something wrong with his headstock or because he is set for the wrong speed is still quite common.

What's Wrong With the Railroad Shops?

THERE IS a general impression that now that the railroad shop strike is over, the problem of maintaining railway rolling stock in good running order is practically solved. People seem to think that all that is necessary is for the shops to work a little harder to catch up with the repairs that were delayed by the strike. Unfortunately many of the higher-ups in railroad circles share this feeling which is entirely unjustified by the facts.

Any engineer or shop man who has ever visited a railroad shop cannot have failed to take away with him the impression of a journey back into the dark ages of machine shop practice. Archaic machine tools, inadequate equipment, poor tools, obsolete methods, ingenious but expensive makeshifts can all be found in any railroad shop. Who is at fault? This is a question that is hard to answer definitely because of the many departments involved and the inter-relation of the various shortcomings.

The labor union rules that limit output and circumscribe the duties of each craftsman are responsible for a small part of the trouble. The remarkable vitality of traditional methods in performing certain jobs and the lack of knowledge of current practice in other machine shops go hand in hand as an indictment of shop management. On the other hand must be considered the necessity for better tools and equipment. With those provided in the average railroad shop by pinchpenny and shortsighted financial management, it is a living wonder how the mechanical department manages to do as well as it does.

The purchasing department, which is frequently permitted to overrule the specifications of the manufacturing department, must shoulder the blame when it procures cheap substitutes that do not meet the requirements. Back of that is the headquarters policy that permits such an uneconomic and inefficient practice to be continued. Going one step farther, we come to the insanely drastic bureaucratic regulation which has done its level best to starve the railroads to death until very recently. If you examine this pyramid of errors, you find that it is so constructed that alibis are easy to construct for every one concerned. Unfortunately, alibis don't repair locomotives. Neither do they excuse incompetence, ignorance nor sloth.

With these conditions clearly in mind, the editorial staff of the *American Machinist* has conducted an investigation with the purpose of pointing out the mistakes that can be corrected and suggesting ways of correcting them. The first article appears in this issue and the others will follow at short intervals. A good many toes are going to be stepped on before the series is ended, but it is our hope that the criticism will be taken in the spirit of constructiveness that prompts it and that a general improvement in railroad shop methods, management, and equipment will be effected by a clear vision of what is actually going on.

Machines Versus Immigrants

UNDER THE above title the *New York Tribune* says some very true things on a subject which has been in our mind for some time. We had planned to editorialize upon it but when we saw it so well handled in the daily press we decided to let an editor whose opinions can hardly be said to hold any bias for machinery builders, as might be said about our own, tell the story. Note particularly the last paragraph.

"The new automatic phones mean a better, temperproof telephone service for the customers. They mean, in the end, a loss of jobs to many operators. They mean a saving in operating cost to the companies. These are the first direct effects of this new machine —effects of a kind that has been happening decade by decade in every direction for over a century now.

"For a long while laborers fought the new machines, seeing only the jobs lost. That was natural enough. Only slowly has the truth been perceived and accepted that by machines the total product of man is enormously increased and thereby shorter hours and a higher standard of living are made possible. Upon the temporary hardship of jobs lost and readjustment compelled rises the whole structure of our modern civilization, eight-hour day, bath-tubs, "movies," newspapers, what not.

"There is one other important aspect of this continuing substitution of machines for hands and brains. The restriction of immigration now in operation is felt to be sound by every American who cares for the future of his country. But there is constantly raised the problem of how the country is to obtain sufficient labor if the European source is thus closed. Part of the answer lies in just such machines as the automatic phone. To be sure, it is overall labor of the roughest kind that is most urgently needed. The phones will not release ditch diggers or road builders.

"But the movement toward automatic machinery is a continuous one and its speed depends largely upon necessity. Our subway trains are now operated by two or three men. The old ticket chopper is a figure of the past. In the B. R. T. trains one man announces the stations in all the cars by megaphone. The electric irons and the mechanical dishwashers have not solved the whole kitchen problem, but they are on the way. What we can feel with every confidence is that the

product of our labor is no fixed sum. Each year it grows whether the total number of laborers grows or not.

"We must expect shiftings. Above all, as machinery has reduced the man power needed in going industry the superfluous workers must shift into other lines. Otherwise the whole gain of machinery to society is utterly lost. The uneconomic situation in the mines today is largely due to just such a refusal to shift. But granted time for these readjustments, there is no reason why the labor needs of the country cannot be met without letting down the immigration bars. Let us have hordes of machines rather than hordes of foreigners difficult to assimilate and holding a peril to the whole structure of our country."

Telling Workmen the Truth About the Company

SPEAKING last week before the Mechanical and Industrial Engineers in Chicago, the following statement was made by John Calder: "Comparatively few employers realize as yet the wonderful potency of just telling their people the truth about any situation. Wage-earners are square and they want to be fair, but they must be shown."

That education is the salvation of the world applies particularly to industry and, the sooner employers realize the fact, the sooner the industrial modern Sword of Damocles—labor troubles—will be eliminated. Knowledge is an eagerly sought and highly prized possession and even the slightest knowledge that contains a ray of hope for the betterment of his economic status is eagerly grasped by the worker. This fact has been a sinister weapon among radical leaders while the employers have failed to recognize it. Just why the employers have been so slow in realizing that ignorance is at the base of most of the ill feeling shown by employees is hard to understand. Perhaps they need a little educating themselves.

The writer of this editorial has seen several workmen estimating the manufacturing cost of the product upon which they were working, leaving out entirely the item of overhead as it was something that so far as they knew had never existed, and showing that the company was making a profit of several hundred per cent while, as a matter of fact, it was under ten per cent. Any employer who will take the trouble to make an investigation will find that those who know the least about the cost of operation are usually the ones who make the most trouble.

The interests of the employer and the employee are identical. Manufacturing and other enterprises are operated for the common good—to enable the worker to achieve economic independence by the fruits of his labor, and to return a fair interest on the money with which the industry was established. When the worker has been shown that he is getting a fair share of the profits, then the entire organization will pull together in peace and harmony and the problem of the age will have been solved.

When buying ceased and prices began to tumble, Swift & Co. called their employees' committee in and showed them the books, as a result of which the committee recommended a general decrease in wages of 15 per cent. Those employers who are searching for a permanent solution of their labor problems will not underestimate the value of this example.

Are You Going to Vote This Year?

NEXT TUESDAY is Election Day. Although the principal prize is not at stake this year there will be plenty of other contests worth watching. The Republicans will try to read an indorsement of the present Administration into the results of the voting, the Democrats a sign of discontent and an augury of hope for the big fight two years hence.

Indications are that the vote in many sections of the country will be light, a sad commentary on the sense of duty of the average citizen. Are you in the indifferent class? Did you forget to register or was it too much trouble? If so, you should be the last one to object if the wrong man wins in your community and you are sentenced to another period of futile protest.

In this day and generation when the forces opposed to law and order are gradually growing more confident and insolent, it is the solemn duty of every law-abiding citizen to go to the polls and cast his vote, even if he takes no more active interest in political matters. Many people feel that the political bosses are so firmly intrenched that it is a waste of time to vote. They overlook the fact that under our form of government a boss is in power only so long as the indifference of his opponents permits.

Cutting Oils vs. Soap Water

A SHORT ARTICLE by H. B. Egg appears in this number under the above title. Apparently the writer is not satisfied with the knowledge as to *what* is being done; he seems to want to know *why* it is being done. This spirit of wanting to know, of wanting to have every-day practice based on some fundamental principle is to be recommended. If more people would show this dissatisfaction with the blind following of other people's action, if more mechanics would open their eyes and see, not merely the outer surface but also the inner working of things, the mechanical arts, and especially machine shop practice, would be on a much higher level than they are today.

Even the combined observations of all good mechanics, however, would not be sufficient to settle such an important question as the one put by Mr. Egg. Such problems should not be solved by experience, but by experiments, though of course, the experience of many people will greatly help to reduce the amount of experimentation required. Here is a subject worthy of the attention of Engineering Colleges, of Universities and other institutions of learning and research.

Just Suppose

JUST suppose that you were one of the faithful, square deal railroad shop machinists who stuck to his job and kept on running the same wabbly old boring mill your father had run before you. And suppose that accuracy with that machine was only obtained through a combination of good luck and the skill of long experience.

What would you say if the foreman came up one day and told you that a new boring mill has been ordered and that you were to run it when it arrived? Of course such things only happen in story books, but—

Just suppose.

Shop Equipment News

Sundstrand Stub Lathe

A machine intended especially for turning such work as automotive pistons and designated as a stub lathe has recently been placed on the market by the Rockford Tool Co., 2400 Eleventh St., Rockford, Ill. The machine can be applied to production work on many other jobs, such as turning automobile wheel hubs, gear blanks, steering knuckles, pulleys, bushings and ball joints. The swing over the carriage is 8 in., while the maximum

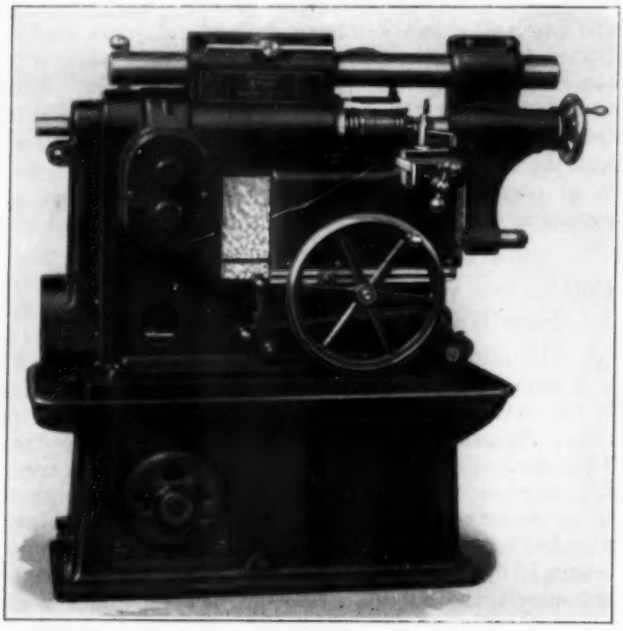


FIG. 1—SUNDSTRAND STUB LATHE

capacity between the centers is 12 in. One operator can run two machines simultaneously, and on many jobs three machines can be operated by the same man.

One of the most noticeable features of the design, as can be seen by referring to Fig. 1, is the fact that the carriage ways and the headstock are one casting. In this way great rigidity is obtained, as is necessary under the heavy cuts that are taken. The bed is well ribbed and braced. It is so designed that chips fall from the carriage into a pan provided for that purpose, and ample room is allowed as a clean-out space at the back of the machine.

The spindle is of large diameter and runs in phosphor-bronze taper bearings that are lubricated by wick feed from an oil reservoir supplied from sight-feed oil cups. The front spindle bearing is 6 x 4¼ x 3¼ in. in size and the rear bearing 3⅜ x 4 in. The take-up device for both bearings is adjusted by means of a single nut at the rear of the spindle. The nose of the spindle is 4 in. in diameter and has two threads to the inch. The hole through the spindle is 1 ⅛ in. in diameter, while the taper hole is 2 ⅛ in. in diameter at the large end and tapers ½ in. per foot. The spindle is driven by means of a bronze wheel and worm provided with ball thrust bearings. The gears regularly furnished with the lathe give spindle speeds of 40, 50, 65, 85, 110 and 145 r.p.m. The spindle is 44 in. above the floor. Provision is made for mounting an air cylinder and a quick-acting draw-back device.

The tailstock is very heavy and is clamped to a large overhanging arm supported by means of a stud protruding from the bed. This arm is 3½ in. in diameter and is so arranged that the tools can be clamped on it for doing operations such as facing and boring the open ends of pistons and center drilling. Adjustment can be made by means of a rack and pinion, the rack being cut on the top of the overhanging arm. A No. 4 Morse taper is employed in the tailstock spindle, which is 2⅜ in. in diameter.

A large diameter screw having a lead of 1½ in. per revolution of the hand wheel is provided in the tailstock. The spindle is of sufficient diameter to prevent springing, and it has a longitudinal adjustment of 5 in. The tailstock spindle bearing is split for its full length and held in position by screws that may be adjusted to care for wear that occurs.

The arrangement of the carriage is worthy of note. It is 18 in. long and has bearing for its full length on the 8-in. face on the front side of the bed and on a 4-in. angular surface on the top. Its extreme travel is 8 in. An angular gib at the bottom of the carriage is provided to take up wear, and adjustment can be made from the front of the machine. The front toolslide has stop screws underneath it for adjustment of the tool and the slide is of sufficient width so that several tools can be clamped on at one setting.

By referring to Fig. 2 the arrangement of the rear tool may be seen. This tool is mounted on a slide having a cross travel of 4 in., as well as ample sidewise

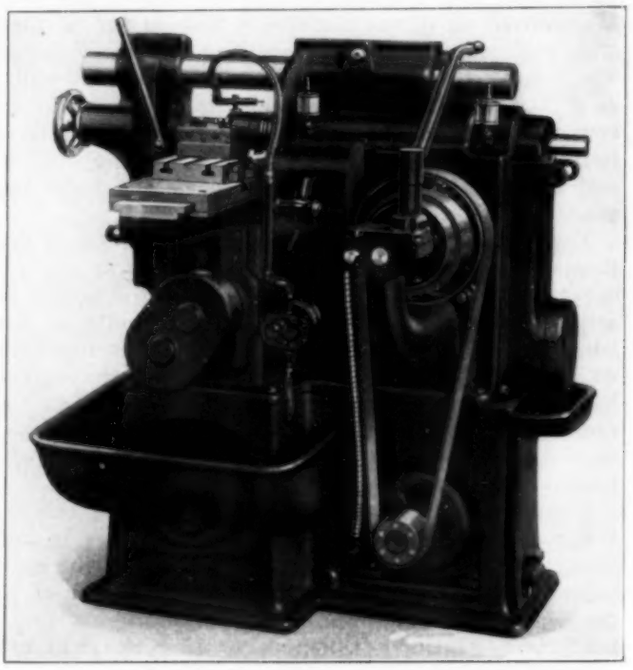


FIG. 2—REAR VIEW OF STUB LATHE

adjustment. The front and the rear tools can operate simultaneously, so that multiple machining operations can be quickly performed.

The feed is driven from the spindle by a chain and pick-off gears located at the headstock end of the machine. The standard gears furnished provide feeds of 0.020, 0.030, 0.038, 0.050, 0.066 and 0.090 in. per revolution of the spindle. The feed arrangement to the carriage and the rear tool is driven through worm gearing with the worm submerged in oil. To engage the feed the worm is lifted to the wormwheel by a handle located at the front of the machine.

The wormwheel is keyed on the pinion shaft which drives the carriage, so that no gearing is required in the apron. On this shaft is a hand wheel measuring 15½ in. in diameter. To trip the feed a mechanism consisting of a dog on the carriage operates the feed lever and automatically disengages the worm from the wheel. It is stated that very accurate stopping of the cut can be made.

Power is transmitted from the motor through a short 4-in. belt. A 5-hp. motor running at 1,800 r.p.m. is regularly furnished and is fastened on a pivoted frame or plate inside the bed and entirely out of the way of the operator. An adjustment is provided for the tension of the belt. A friction clutch pulley is located at the back of the machine and mounted on roller bearings, with the starting handle conveniently placed for the operator when he is in his proper position at the front of the machine.

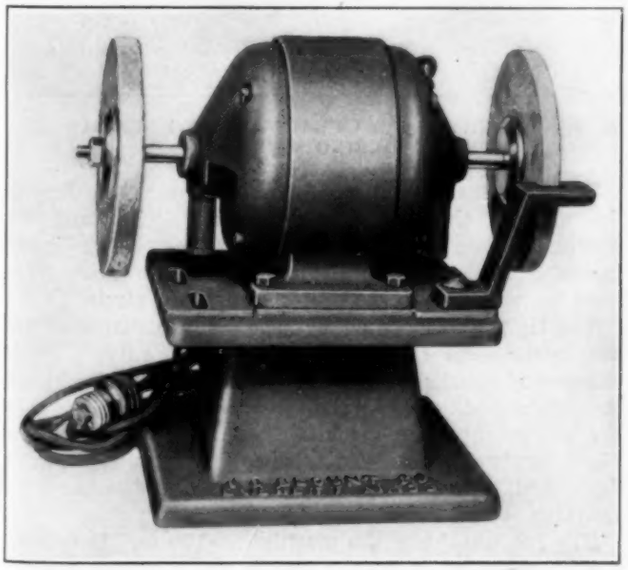
An oil pump driven from the main drive friction pulley is provided. The tank for the cutting lubricant is located in the bed below the chip pan. The machine requires a floor space of 46½ x 33½ in., a small space in consideration of the capacity of the machine. The net weight with the motor is 3,000 pounds.

Blount "Special" Combination Bench Grinder and Buffer

A plain-bearing, motor-driven combination grinder and buffer of the bench type, designated at the "Blount Special," has recently been placed on the market by the J. G. Blount Co., Everett, Mass. The tool is suitable for light work in garages, repair shops and other places in which grinding and sharpening operations are required.

The motor with which the machine is equipped is a standard Westinghouse single-phase motor giving ¼ hp. at 1,800 r.p.m. It can be supplied either for single-phase alternating current of 110 or 220 volts and 60 cycles, or for direct current of 32, 110 or 220 volts. The ground spindle runs in wick-oiled bronze bearings and carries a 6 x ½ in. grinding wheel and a 7 x ⅜ in. sewed buffing wheel.

The base of the machine carries a cast-iron toolrest, and is slotted so that guards can be fitted for the wheels. If it is desired to use the machine as a small power unit, a 2-in. V-belt pulley can be furnished on the spindle between the flange and the motor bearing. A flexible cord and plug are furnished so that the machine can be attached to the nearest circuit, and yet be readily portable. The weight of the machine is 42 lb. net, and 60 lb. when boxed for shipment.



BLOUNT "SPECIAL" BENCH GRINDER AND BUFFER

C.L.P. Portable Electric Drills

A line of portable drills has recently been placed on the market by the C. L. P. Electric Co., 62 Dey St., New York, N. Y. Although larger sizes of drills will be added, at present ¼ and ⅜ in. sizes are made.

The casing of the drill is of aluminum. The weight of the ¼ in. machine is 6 lb., while that of the ⅜ in. is 14 lb. Universal motors are used in both machines, and can be furnished for either 110 or 220 volt current. The armature runs on ball bearings. A fan is provided for air cooling the motor, the intake being at the rear end. The cable connection to the drill is simple, so that the cable can be removed without disturbing any inside connections. The units of the drill are so arranged as to be easily assembled and dismounted.

The drill is equipped with a three-jaw Jacobs chuck that is threaded to the end of the spindle. The chuck can be removed without disturbing any part of the drill. Extension spindles can be supplied for drilling in inaccessible places. Because of the offset position of the spindle, holes can be drilled close to a corner. The spindle has a ball thrust bearing and bronze radial bearings. The oil holes through which the gears and

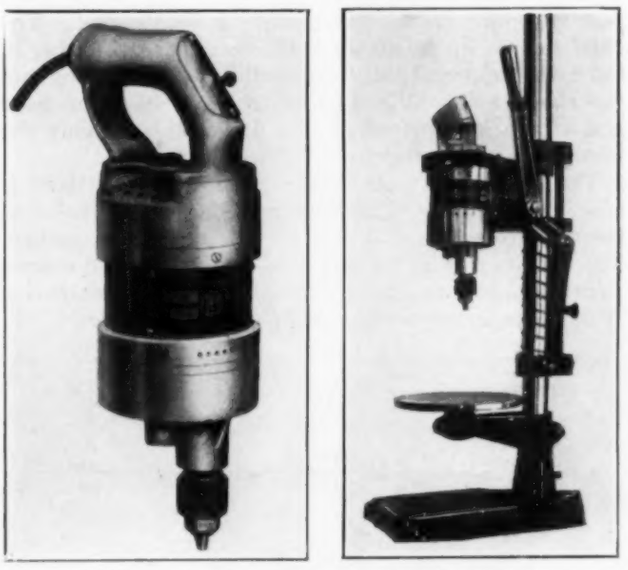


FIG. 1—C.L.P. ¼-IN. PORTABLE ELECTRIC DRILL AND STAND

lower bearings are lubricated are provided with self closing devices so that the oil is retained and dirt is prevented from entering.

At the left side of Fig. 1 is shown the ¼-in. machine. It will be noted that the large handle at the rear of the motor is equipped with a switch that stays in either the on or off position, and yet is so placed that it is always within easy reach for starting or stopping the motor. On the right side of the illustration is shown

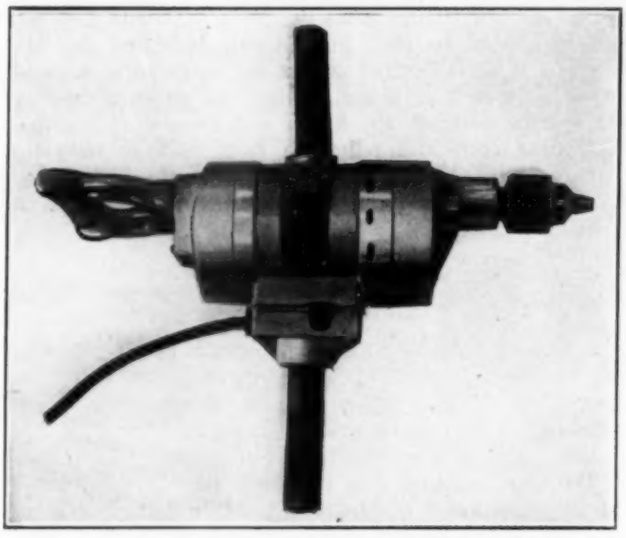


FIG. 2—C.L.P. ½-IN. PORTABLE ELECTRIC DRILL

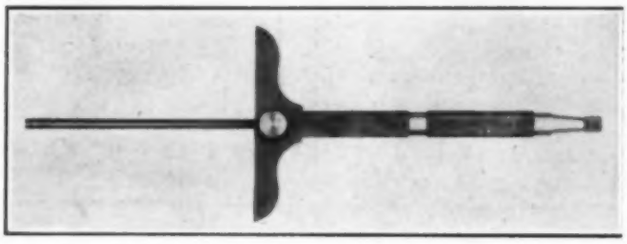
the stand that can be furnished when it is desired to do precision drilling on a bench. The usefulness of the tool is thus greatly enlarged.

The ⅜-in. drill is equipped with two side handles as well as a grip handle, as can be seen in Fig. 2. The switch is placed in one of the side handles and is completely encased in a fiber covering. Each machine is furnished with a plug and 10 ft. of cable.

Starrett Spring Depth Gage

The L. S. Starrett Co., Athol, Mass., has recently placed on the market the No. 48 spring depth gage that is shown in the accompanying illustration. The chief feature of the device is the fact that the spring in the barrel automatically forces the rod downward and the clamp screw locks the rod in position. The gage has a capacity up to 3 in., its principal use being the measuring of the depth of drilled holes.

The gage has a base 2½ in. long and the rod itself is ⅛ in. in diameter. The base and the contact point of the rod are not lapped, but are tempered and ground. The contact end of the rod is square instead of convex, in order to make it easier to manipulate when measuring from a plane surface to a very narrow shoulder.

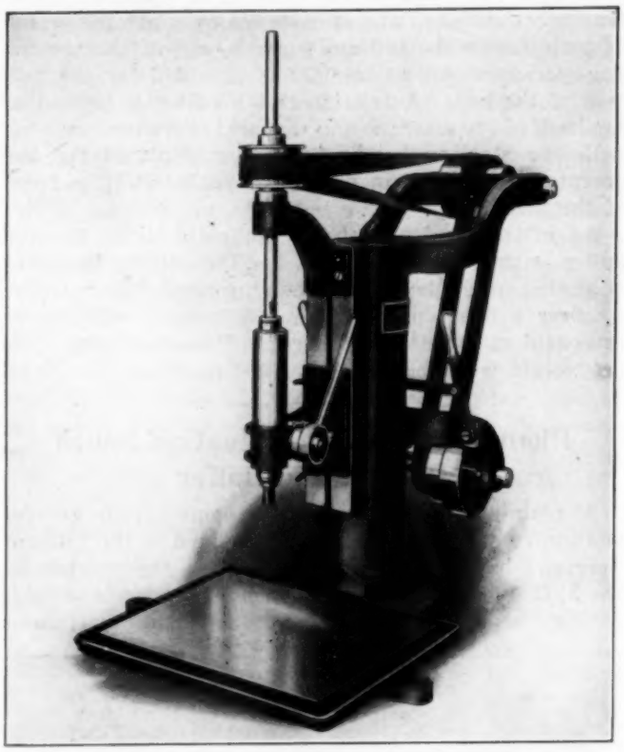


STARRETT SPRING DEPTH GAGE

Sigourney No. 1 Bench Drilling Machine with Plain Bearings

The Sigourney Tool Co., Hartford, Conn., has added to its line of sensitive drilling machines the No. 1 bench-type machine shown in the accompanying illustration. This machine is similar in design to the concern's ball-bearing, high-speed drilling machine, but is intended for slower speeds. Except for a ball thrust bearing to take the drilling pressure, the parts run upon plain bearings of bronze. The normal capacity is for drills up to ⅜ in. in diameter, although larger can be carried. A chuck is employed for holding drills up to ⅜ in. in diameter, although for larger sizes taper-shank drills are used.

The spindle is not enclosed. It has a taper hole to take a No. 1 Morse taper shank. The vertical movement of the spindle is 2½ in., actuated by a rack and pinion with hand lever. The spindle is balanced by a coil spring concealed in the case of the spindle bracket. A clamp stop is provided to regulate the depth of the hole drilled.



SIGOURNEY NO. 1 PLAIN-BEARING BENCH DRILLING MACHINE

The head may be adjusted vertically upon the face of the column through a distance of 6 in., and the maximum height attainable under the chuck is 8¾ inches. The table is 10½ by 14 in. in size. The machine will drill to the center of a 13-in. circle.

The tight and loose pulleys are 6 in. in diameter and are intended to run at a speed of 450 r.p.m. Three changes of spindle speed are available through the three-step cones and belt. All pulleys are balanced. The belts are endless and the machine is shipped with belts in place, ready for use. An overhead countershaft can be furnished, although ordinarily none is used because the machine is run direct from the lineshaft.

The net weight of the machine is 170 lb. Boxed for export shipment it weighs 300 lb. and occupies a space of 20 cubic feet.

Pratt & Whitney Duplex Hand and Automatic Centering Machines

A double-ended centering machine for handling at high speed work on small shafts and similar parts has recently been placed on the market in both the hand-operated and the automatic types by the Pratt & Whitney Co., 111 Broadway, New York, N. Y. The hand-operated machine, which is illustrated in Fig. 1, is intended especially for shops where a variety of work is handled and where it is desirable to make quick adjustments for all sizes within the capacity of the machine.

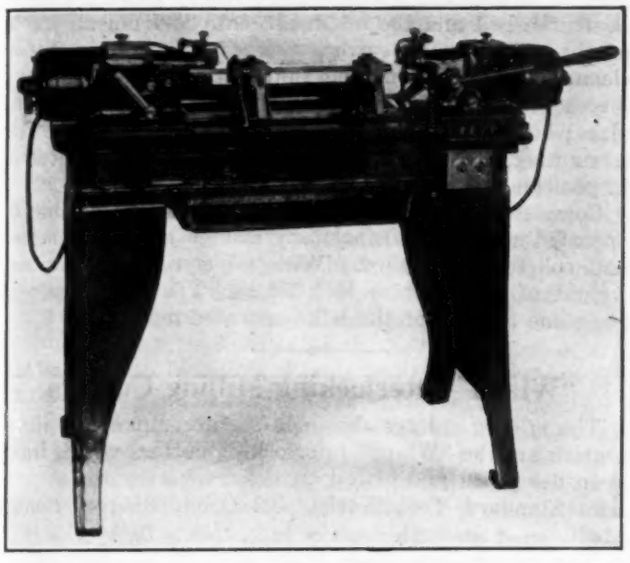


FIG. 1—PRATT & WHITNEY HAND CENTERING MACHINE

While the machine is normally equipped with opposed drill heads for centering both ends of the work in one operation, it can be supplied with only one head in case the parts to be centered are longer than the capacity of the doube-ended machine. The right-hand head is permanently attached to the bed, while the left-hand head is adjustable to suit different lengths of work, or it can be removed entirely for performing work on long pieces.

Both heads are normally operated together by the hand lever on the right-hand head. The drills are fed in by hand until they contact with both ends of the work, which is placed loosely between the jaws of the vise so that it can shift endwise. When contact is secured at both ends, both jaws of the vise are tightened at the same time by a lever operated by the left hand of the operator. The holes are then centered by further pressure applied on the lever in the right hand.

The drill spindles are mounted in sliding bronze bearings and provided with ball thrust bearings. They are each driven by a constant-speed motor, geared to provide drill speeds of either 1,200 or 1,800 r.p.m. The spindles can be locked in place for changing gears or removing drills, a small knob on the top of each head serving this purpose.

In order to hold the depth of drilling to the dimension desired, adjustable stops are provided which are mounted on the head and bear against the ends of the work to limit the forward movement of the spindles. In case it is necessary to have the center holes the same distance apart regardless of slight variations in the length of the work, adjustable stops are positioned to engage lugs on the drill heads, so that the spindles have a predetermined forward movement.

The motors are of ¼ hp. for either 110 or 220 volt alternating or direct current. They operate at 1,700 r.p.m., are totally inclosed, and in the alternating-current type are suitable for either 1, 2 or 3 phase. A switch is furnished so that the motors can be connected directly to the line.

Two quick-acting self-centering vises take all sizes of work up to 2 in. in diameter, and from 3 to 18 in. long. They are adjustable along the length of the bed, and are operated simultaneously by one lever. For heavy work up to and including 4 in. in diameter, adjustable V supports are used. Locking screws maintain the adjustments, and one of the supports has a clamp lever to hold the work in place.

After the work has been centered, it is deposited in a removable metal tote box at the rear of the machine. The oil drains from this box to the tank and is conveyed to the drills by means of a plunger pump. This pump is connected to the hand feed lever, and oil is supplied to the drills only while cutting is going on, without special attention from the operator.

Although special collets can be furnished for extra sizes of drills, two sets are normally included in the equipment. One is 11/64 in. in diameter for M, L and E drills, and the other 7/16 in. in diameter for A, B and C drills. For work over 5 ft. long, an outboard support can be furnished. The machine requires a floor space of 4 ft. 6 in. x 2 ft. 6 in. The net weight with the complete equipment is 600 pounds.

On the automatic machine, a front view of which is shown in Fig. 2, an automatically operated feeding mechanism working in conjunction with a magazine is employed. The work is clamped mechanically, so that after the set-up has once been made it is only necessary to keep the magazine supplied with work and take away the finished parts. The work is removed from the

FIG. 2—PRATT & WHITNEY AUTOMATIC CENTERING MACHINE

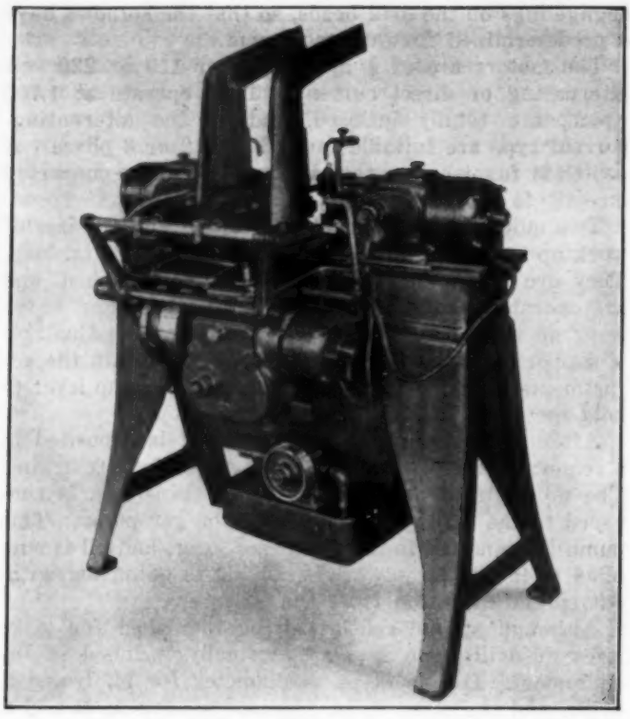


FIG. 3—REAR VIEW OF AUTOMATIC CENTERING MACHINE

magazine by transfer slides, placed in the vise, clamped, centered and then released into the work box independently of the operator.

The drill heads themselves and their driving motors are similar to those employed for the hand-operated machine. The feed of the spindles is automatic, and is operated by the same cam that operates the transfer slides. This cam is driven by a small motor similar to the motor driving the spindles, and a set of change gears provides the means of adjusting the drilling time to suit the nature of the work. Fig. 3 shows the third motor mounted on the back of the machine and the arrangement of the magazine and other parts.

During the centering operation the drills are automatically withdrawn twice so as to clear them of chips and allow oil to enter the drilled holes. Each spindle has a maximum feed movement of $\frac{3}{4}$ in. which may be reduced by a regulating lever to $\frac{1}{16}$ in., with any variation between to suit the size of the drills and the nature of the work.

The machine may be run through its cycle of operations by hand to check the set-up, a crank being employed for this purpose. The method of holding the depth of the hole uniform is very similar to that employed on the hand-operated machine. Stops can be mounted to bear either on the ends of the work or on the drill heads themselves, depending upon the requirements of the drilled holes.

The magazine and work supports are mounted on the head castings so that it is only necessary to move the heads along the bed to accommodate various lengths of work. This length when both ends are to be centered varies from $2\frac{1}{2}$ to 18 in. Work from $\frac{1}{4}$ to $1\frac{1}{2}$ in. in diameter can be accommodated.

The work is supported by V-shaped jaws during the centering operation. These jaws are provided with adjusting screws so that they may be set to any desired diameter, while an automatic compensating arrangement takes care of minor variations in the diameter of the work. The transfer plates on the slides remain in contact during the drilling and serve to clamp the work in the jaws. Different transfer plates to take care of various diameters of work can be easily mounted, and four sets of plates cover the range of the machine. By an adjustment of the V jaws, it is possible to drill holes out of center on one or both ends, such as might be wanted for driving pins used in grinding operations or for short oil holes. Facing or chamfering tools may be used in place of the drills when necessary, so that the scope of the machine can be enlarged.

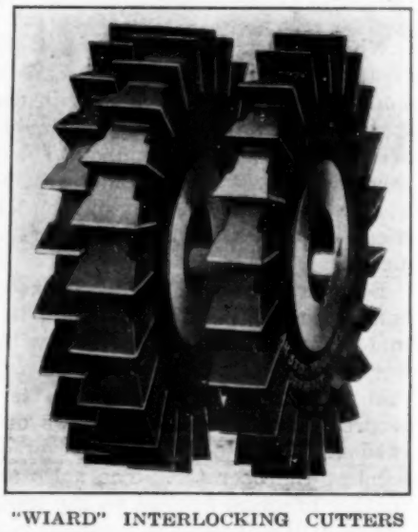
Oil is supplied to the drills by a geared pump running at a constant speed. The tank is located underneath the bed and the oil drains into it from all parts of the machine. The work box can be taken off for cleaning and for removing finished work. The work pieces are ejected directly into the box when it is in place; but when the box is removed while the machine is running, a deflector hinged on the bed can be latched in position to catch the work.

Complete equipment such as furnished with the hand-operated machine and including change gears, wrenches and collets, is supplied. With all equipment the net weight of the machine is 1,020 lb. The floor space is the same as that of the hand-operated machine.

"Wiard" Interlocking Milling Cutters

The milling cutters shown in the accompanying illustration are the "Wiard" interlocking cutters which have been developed and placed on the market by the American Standard Tool Works, 402 Owen Bldg., Detroit, Mich.

The cutters are made from drop-forged high-speed or carbon steel, and are so constructed that they can be used singly or in sets. When more than one is employed, the sides of the teeth of one cutter fit into corresponding grooves in the side of the mating cutter. Cutters can thus be ground in pairs, with the advantage that when the sides of the teeth become dull, the cutters can be changed to bring the opposite sides into play so that full wear will be obtained from every cutting edge. The chief features of the cutters are the ability to use all of the cutting edges, to employ the cutters singly or in combination interlocked with each other, and to maintain the width of the slot milled by a set of the cutters.



"WIARD" INTERLOCKING CUTTERS

Individual sections can be used as ordinary side milling cutters if desired. As the cutters become narrowed by grinding, a pair can be spread apart so as to maintain a given dimension. The cutters are made in standard sizes for diameter, and of such widths that practically any standard or special size can be obtained by using the cutters in combination.

Davenport Bevel Gear Testing Machine

A machine for subjecting to a running test spiral bevel gears and pinions of the style employed in the differentials of automobiles, has recently been placed on the market by the Davenport Machine Tool Co., Inc., Rochester, N. Y. The machine has sufficient capacity for handling all sizes of gears made for such work. Tests for determining the bearing obtained on the teeth, the quietness of running and the center distance at which the best bearing and the least noice occur, can be made on the machine.

The machine, a front view of which is shown in Fig. 1, is rigidly constructed so that accuracy is obtainable, and it incorporates a number of devices to promote rapidity of operation. There are two headstocks, one for holding the gear and the other for the pinion. The pinion is rotated by power, and a brake is incorporated to retard the speed of the gear, so that load can be applied. Both spindles are equipped with Hess-Bright ball bearings on each end, with an arrangement for keeping the oil in the bearings at a constant height.

Both of the headstocks have large bearing surfaces on the bed, and dovetail slides with taper gibs extending their entire length. Provision is made for tighty clamping the headstocks to the bed by means of bolts passing into blocks in T-slots in the bed. These bolts are close to the bearing surfaces, so that the headstocks and the bed are rigidly secured while the test is going on.

Due to the fact that there is usually but little adjustment required of the left-hand headstock on which the crown gear is mounted, this headstock is clamped down by a lever attached to one of the hold-down bolts with an adjustable connection to the second bolt, so that the bolts can be tightened equally at the same time and with one movement.

Since the right-hand headstock is moved considerably each time a pinion or gear is changed for testing, provision has been made for quickly operating it by air pressure. An air cylinder mounted on the back of the machine serves to draw back the slide a sufficient distance. The pinion or gear can then be changed and mounted to mesh again in exactly the same position at which the last gears were tested. Other positions can be obtained, of course, as controlled by the handwheel with a graduated dial which is located underneath the right-hand headstock. Due to the fact that this headstock is moved so often, provision is made for clamping it by means of an air cylinder. An air chuck is fitted to the machine for quickly clamping the pinion.

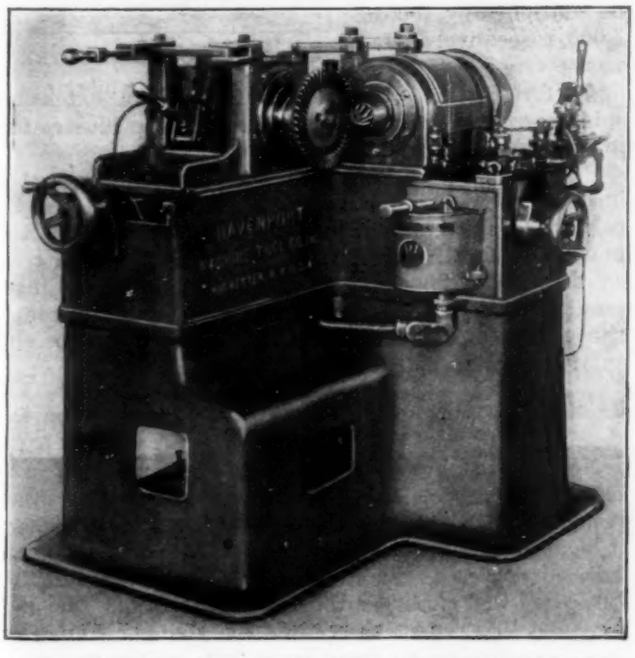


FIG. 1—DAVENPORT BEVEL GEAR TESTING MACHINE

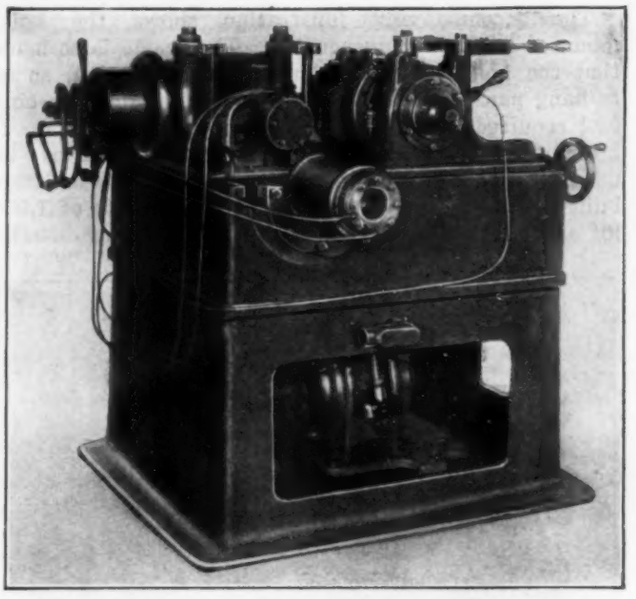


FIG. 2—REAR OF DAVENPORT GEAR TESTING MACHINE

The three valves on the front of the machine are, respectively, for clamping the work in the spindle, for moving the slide so that the pinion and the gear mesh, and for clamping the right-hand headstock. Thus moving back the slide and releasing the pinion, as well as reclamping the pinion and bringing it in place, can be very quickly accomplished.

By referring to Fig. 2, which shows the rear of the machine, the arrangement of the air cylinders can be seen. The position of the driving motor, which is of 3 hp. and driven by either alternating or direct current, can also be observed. Its position in the base permits a saving in floor space, as well as protects the motor. The motor is so mounted that the correct tension of the belt is maintained as the slide moves back and forth. It is controlled by a switch so that the spindles can be driven in either direction.

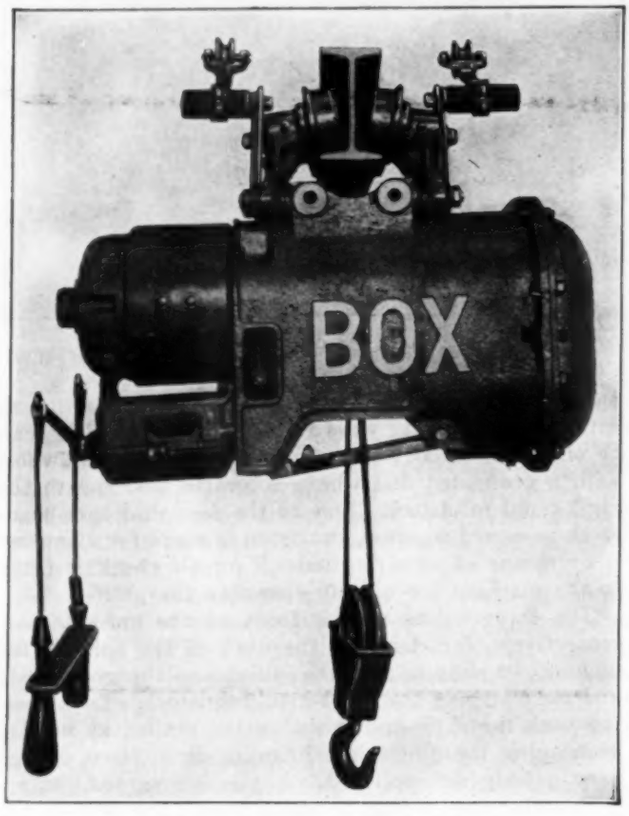
The exhaust from the air cylinders is piped to the brake band on the crown-gear headstock so as to cool the brake when a load is being absorbed. If preferred, water may be circulated through the brake for cooling purposes.

The machine occupies a floor space about 4 ft. square, and has a net weight of about 1,500 pounds.

Box "Load Lifter" Electric Hoist

A small electrically operated hoist intended for continuous service has recently been placed on the market by Alfred Box & Co., Inc., Philadelphia, Pa., under the name of "Load Lifter." Although the hoist is only 11 in. wide and 28 in. long, it is made for heavy duty such as is ordinarily encountered where continuous service is necessary and where the operator does not take the greatest care of the equipment.

The accompanying illustration shows the hoist mounted for trolley suspension. The frame is so made that the hoist may be turned through 90 deg. so as to hang parallel with the rail, a wrench being the only tool required. The trolley is adjustable to run on I-beams from 5 to 9 in. in size. Hook suspension may be used when the trolley is not required. The hoist is built in one size only and is rated to lift loads of 1,000 lb. on a two-part line at 20 ft. per min., or 500 lb.



BOX "LOAD LIFTER" ELECTRIC HOIST

on a single-part line at 40 ft. per min. The hoist has a drum which will accommodate nearly 80 ft. of rope, so that long lifts can be made even when a two-part line is employed.

The mechanism is completely enclosed, so that dirt and dust cannot get in and oil can be retained. Since the motor and controller are totally enclosed, the hoist may be installed in practically any position without danger of injury to the mechanism. Self-aligning S.K.F. bearings are used in the motor, and Hyatt flexible roller bearings at other points. All gears are forged steel and heat-treated, the teeth being of the stub type. The bearings are cast integral with the frame of the hoist, so that permanent alignment is maintained. All shafts are manganese steel.

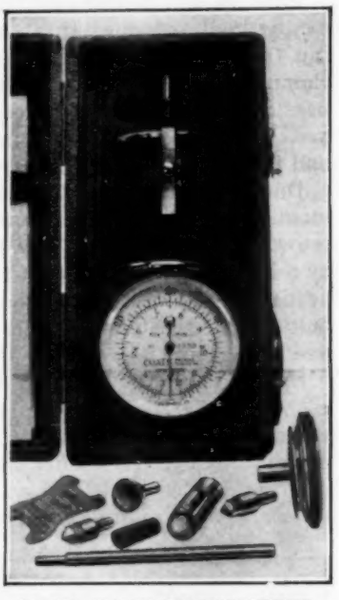
A multiple-disk load brake and a band brake on the motor shaft are both provided for holding the load in position. All parts are lubricated from one point by a combination of splash and force-feed systems. Oil must be poured into the hoist at only one point about every six months.

The controller is of the drum type and has non-arcing fingers. A terminal block is built in the controller to facilitate wiring. The hinged cover aids inspection. The controlling handles are mounted on a double lever so that they are easily accessible.

Coats Hand Tachometer

A hand tachometer recently placed on the market by the Coats Machine Tool Co., Inc., New York, N. Y., for obtaining a reading directly in revolutions per minute without watch-timing, or in circumferential feet per minute without calculation and irrespective of the pulley diameter, is shown in the accompanying illustration. The tachometer is of the pendulum or governor type and is equipped with a damping mechanism to prevent vibration and to make the instrument "dead beat." It is stated that the device is not affected by magnetic or electrical influences or by moisture or temperature changes.

The tachometer is equipped with a single spindle and arranged for either three or four ranges of speed for speeds from 30 to 1,600 r.p.m. It can be operated in either direction. A mechanically operated level is provided on the dial to indicate when the instrument is in exact horizontal alignment with the shaft to be tested. However, the tachometer may be used vertically or in any other position with equal accuracy. The device is small so that it can be easily handled, and weighs only one pound.



COATS HAND TACHOMETER

The dial is provided with two scales. The inside scale reads from 3 to 12 and the outside scale from 1 to 4. The first and third speed ranges that are marked on the body of the tachometer should be used in connection with the inside scale, and each figure should be multiplied by either 10 or 100. The second and fourth speed range works in conjunction with the outside scale, and each figure should be multiplied by 100 or 1,000, respectively. Various types of couplings for contact with the shaft and an extension spindle are provided, as can be seen in the illustration in front of the case.

For obtaining surface speeds, a "cutmeter" wheel 6 in. in circumference is employed. This wheel can be held in contact with a moving surface so that the number of lineal feet of travel per minute can be read on the dial. When the center of the shaft is inaccessible, a thread can be run over a pulley and through the groove on the cutmeter wheel to obtain the circumferential speed.

Personal Insurance

Nowadays, prominent insurance companies issue blanket policies at such low rates that, if for no other reason than to aid in keeping down the labor turnover, it would pay a management to take out policies on certain employees at its own expense. The greater the turnover, the more desirable is such action. It may have but little effect as regards the younger employees and those having no dependents, but, on the others, it is a good bond.

News Section

S.A.E. Production Meeting Widely Attended

Successful beyond expectations was the first production meeting of the Society of Automotive Engineers which was brought to a close after a two-day session in Detroit on Friday evening, Oct. 27, with a dinner at the Hotel Statler.

Interest of a national character was evident from the large gathering of executives of the automotive industry, embracing not only production but sales, administrative, service and engineering departments as well. Nearly every phase of manufacturing allied to the industry had representatives present and the consensus of opinion at the close of the sessions indicated that the meeting had been productive of a great deal of value.

Keen Interest Shown in Papers

The session of Thursday, Oct. 26, was taken up by four papers of importance. E. Karl Wennerlund discussed The Group-Bonus and Its Application, describing a system of labor and production control having advantages over the piece work, premium and flat-wage methods, in that it eliminates a large part of the complicated factory cost system.

Messrs. P. E. Haglund and I. B. Scofield described, in a paper entitled, Cylinders from the Ore to Finished Part, the methods and processes followed in Ford cylinders at the River Rouge plant. F. A. Mance of the Studebaker Corporation talked on Tool Allotment and Costs as applied to the operations in that company's operations.

New Methods of Processing Splined Shafts, was the title of a paper read by J. A. Ford in which the machining of splined shafts to precise limits without grinding received careful study and set forth valuable experience resulting from shop experiments.

The sessions of Friday, October 27, was no less interesting. A. J. Baker of the Willys-Overland Co. offered suggestions of value to production men, tool supervisors and superintendents in his paper on Selection of Machine Tools. The experiences of the Packard Co. in matters of production were related by Messrs. H. J. Crain and J. Brodie in their joint paper, Some Experience from a Production Note Book. K. L. Hermann's paper, Production Errors in Gears, bore evidence of an exhaustive investigation of gear tooth variation and its effect on gear noise. William Dunk of the Franklin organization discussed problems met in the production of air-cooled engines and R. K. Mitchell in his paper, Machine Tool Efficiency, dealt of the error of purchasing expensive special machine tools to perform operations readily accomplished on standard machines, stressing the overproduction with resultant frequent idleness of the former.

The afternoons of each day were set apart for inspection visits to the River Rouge plant, Dodge Brothers, Packard Motor Car Co., Cadillac and others. The banquet of Friday evening was presided over by Harold Emmons, with addresses by Pierre DuPont, president of the General Motors Co., A. B. C. Hardy, president of the Olds Motor Co., and Kettering Bachman.

Ethan Viall Returns to the American Machinist as Ohio Editor

Arrangements have been made whereby Ethan Viall, former editor of the American Machinist, will serve the interests of the subscribers and advertisers in the Ohio territory. Mr. Viall, who is well known to readers of the American Machinist through his ten years service on the editorial staff, has given up his business interests and settled in Cincinnati at 7474 Lower River Road, Fernbank. He will devote half his time to editorial work reserving the remainder for the completion of several technical books which have been under way for some little time.

Personnel Association Opens 1st National Convention

Industrialists, educators and personnel experts representing the country's largest business and manufacturing enterprises will engage in a three-day national forum, beginning Nov. 8, at Pittsburg, under the auspices of the National Personnel Association. Centering around the numerous discussions, addresses and committee reports, covering a wide range of administrative effort, will be the problem of "the human factor," now of outstanding importance in this and other countries.

The Pittsburgh gathering will mark the first annual convention of the Association which has taken over the activities of the National Association of Corporation Training and the Industrial Relations Association of America.

Among those who will read papers and address the sessions are: Michael Pupin, professor of electro-mechanics, Columbia University; Magnus W. Alexander, National Industrial Conference Board; H. M. Jefferson, Federal Reserve Bank of New York; Dr. E. K. Strong, Jr., Carnegie Institute of Technology; C. S. Ching of U. S. Rubber Co.; Dean R. L. Sackett of Pennsylvania State College; C. R. Dooley of personnel department, Standard Oil Co.; Dr. E. S. MacSweeney, New York Telephone Co.; Dr. R. S. Quimby, Hood Rubber Co.; Dr. F. L. Rector, National Industrial Conference Board; Paul E. Wakefield, Carnegie Steel Co;. E. K. Hall, vice president, American Telephone and Telegraph Co.; and F. L. Bishop, dean of the University of Pittsburgh.

Exporters Discuss Allied Debts at Convention

Passing resolutions endorsing the constructive policy of President Harding on the merchant marine and recommending that an international conference of business men be called together at the invitation of the U. S. Chamber of Commerce to discuss the inter-allied debt, the American Manufacturerrs Export Association brought its thirteenth annual convention to a close at the Waldorf-Astoria on Thursday evening, Oct. 26, after a two-day session.

The chief feature of the convention was the discussion of the inter-allied debt problem which took place on Wednesday evening, Oct. 25, with Sir George Paish as the chief speaker. Lewis E. Pierson, chairman of the Board of the Irving National Bank, presided and other addresses on the problem of debt cancellation or adjustment were made by George Ed. Smith, president, Royal Typewriter Co., Julius H. Barnes, president, U. S. Chamber of Commerce and Gerard Swope, president, General Electric Co.

At the banquet in the evening Alba B. Johnson of Philadelphia acted as toastmaster and addresses were made by A. C. Bedford, chairman of the board, Standard Oil Co.; Sir George Paish and Don Frederico Alfonso Pezet, Ambassador from Peru, all of whom urged settlement of debts on a reasonable and economic basis.

At the close of the business session on Wednesday, Oct. 25, Col. Myron W. Robinson was re-elected president for the ensuing year. Two new vice presidents were also elected at this session. They were W. H. Robinson of the J. H. Heinz Co., Pittsburgh, Pa., and E. P. Thomas, president of the U. S. Steel Products Co., of New York.

The morning session of Thursday, Oct. 26 was marked by a discussion of the Ship Subsidy Bill, Homer L. Ferguson president of Newport News Shipbuilding and Drydock Co., presiding. Edward C. Plummer, commissioner, U. S. Shipping Board and Hon. George W. Edmunds of Philadelphia spoke.

Meeting of Electric Steel Founders

The chief executives and the operating officials of the companies comprising the Electric Steel Founders' Research Group recently held a 3-day meeting at Wernersville, Pa., at which exhaustive progress reports were presented on researches being conducted by the organization into annealing; core practice; facihg practice; furnace practice, and the elimination of slag from castings. It is stated that there has been gratifying progress in each group investigation and that the improved volume of business in the industry at present affords better opportunity for the prosecution of certain researches than when operations were curtailed during 1921.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE Secretary of Agriculture, Mr. Wallace, delivered an address last week in which he was very emphatic in demanding lower freight rates for farm products. As it is unlikely that the Secretary of Agriculture would have spoken so forcibly without the approval of the President, his speech is perhaps the most important news of the week in its relation to domestic affairs.

The appeal for lower rates voiced by Mr. Wallace came just as the Pennsylvania, the Norfolk & Western and some other railroads announced the resumption of pre-war dividends, and since cheaper transportation for goods and passengers is not consistent with increased dividends unless the costs of operation can be reduced by consolidation it is not surprising that the railroad combinations for which the Esch-Cummins bill provides are again being seriously discussed. The old plan under which the Northern Pacific, the Great Northern and the Burlington would be operated as one system is again being discussed, it is reported that the New York Central will take over the Western Maryland, and many other amalgamations are being suggested.

As they take shape it will probably be discovered that many railway securities now selling at big discounts have a value hitherto unrealized. This explains the relative firmness of railway shares in the securities markets, which have been otherwise spotted as a somewhat lower range of values for both bonds and stocks.

The Liberty issues have continued to reflect the hardening of the money market and even Secretary Mellon's new 4¼s are below the issue price. Taxable bonds have of course taken their cue from Government securities. They, too, are cheaper. The automobile stocks are distinctly lower, chiefly as a result of the Ford cut in prices, and the rest of the list has been rather droopy despite the continued declaration of stock dividends by some of the oil companies and the flagellation of the market by those who have hoped that a simulation of activity would reattract speculation.

Commodities, on the other hand, have been firm and in many important staples an advance over last week's prices has been recorded. Cotton and cotton goods have been conspicuously strong. So have wool and woolen goods. Rubber has held most of the advance recently recorded. The tendency in the cereal markets is still upward. Coffee, tea and rice have been relatively firm. Old crop sugar has again advanced. A statistical scarcity until the new crop is available is indicated, as the unsold stocks in Cuba have dwindled to only 75,000 tons.

Among the metals copper is the only laggard. Iron, steel, zinc and tin are all in good demand at full prices. It may be that some of the staple commodities are nearing a price level at which consumption will be checked, but this is doubtful for optimism is general and in the cities at least there is no unemployment. Good wages are to be had by all those who are willing to work.

The theory of gold inflation to which I have previously referred is becoming generally accepted as explaining the contrasting strength of the commodity markets and the weakness of the security markets. The latest authority of distinction to accept this theory is the Harvard Committee on Economic Research. Its chairman predicts steady and advancing prices for the next decade because an annual increase of $150,000,000 in the world's stock of monetary gold for the next eight years is indicated. Sir George Paish of London who is over here on a lecture tour is talking in the same strain and many conservative merchants and financiers who were formerly disposed to "pooh pooh" what they called the college professor's view of economic questions are now coming to realize that the purchasing power of gold as expressed in other commodities is declining and will probably continue to decline as long as the United States remains the only important country in the world using the gold standard and thereby attracting hither most of the new gold produced.

> The outstanding problem of the moment before American business men is that of the inter-allied debts. It is idle to suppose that our present prosperity can long continue if the countries abroad cannot buy the great quantities of American agricultural products which they have purchased in the past and of which they stand in need at present. And buy they cannot, if they are unable to sell their own produce.

To say that the purchasing power of gold is declining is but another way of saying that the value of commodities as expressed in terms of gold must advance and that the prices of securities must decline, for the value of the latter is only that of gold.

Premising the correctness of this theory a further advance in commodities and a decline in securities, especially bonds, seem to be indicated. But it is not to be expected that any of the markets will progress continuously in one direction. Reactions will occur from time to time and for such reactions intelligent business men should prepare themselves. No rule that will be universally applicable can be formulated and common sense, assisted by close observation, must still be used in navigating the uncharted channels of business.

When everyone has accepted the theory of gold inflation it will probably be found that its effect has been discounted.

My reports from abroad are that the use of the American dollar as an unofficial medium of exchange is increasing throughout continental Europe, and the decline in francs, lira and other continental currencies is attributed chiefly to the eagerness to exchange worthless paper money for a currency of integrity that is payable in gold.

Chancellor Wirth's proposal that the German government should declare itself bankrupt has caused some consternation among the thoughtless, but with marks selling at 2¼ cents a hundred the bankruptcy of Germany would seem to have been unofficially confessed and it is to be remembered that the bankruptcy of a Government does not necessarily imply the bankruptcy of its people. The truth of this observation is attested by the reports of improved business in Europe now being received.

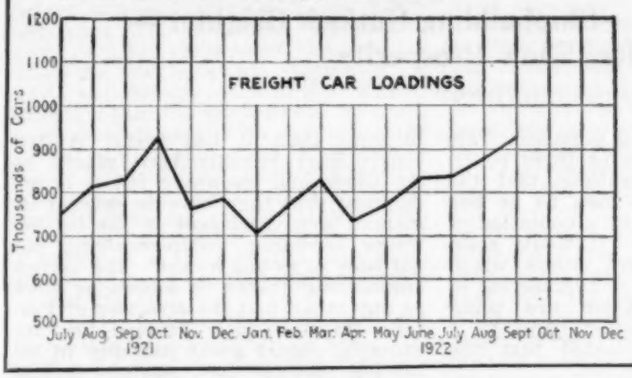
At a meeting of the American Manufacturers' Export Association, Dr. Julius Klein, a Government expert, expressed himself most optimistically in regard to conditions in Europe and a friend of mine who is a large dealer in naval stores told me that he had sold 5,000 barrels of rosin to Russia last week, being paid in dollars.

The weekly statistics are not especially significant. The reserve ratio of the Federal Reserve System shows a gain of 2.4 per cent. It now stands at 77.6 as compared with 75.2 a week ago. The improvement is probably due to the liquidation of credit incident to the distribution of the Government bonds recently brought out. The gold held shows a reduction of nearly $2,000,000, which probably reflects the continued disbursement of gold certificates or "yellow backs" by the banks.

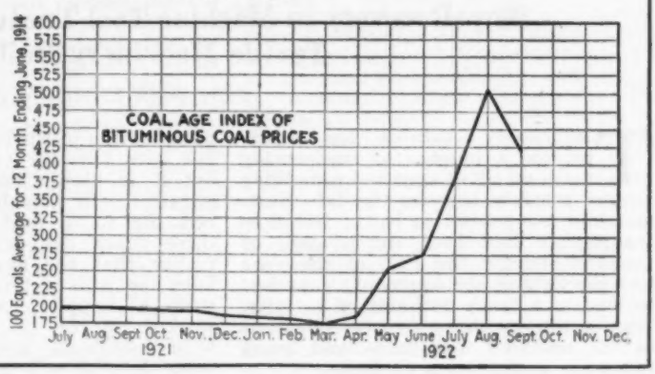
The correspondence between Representative Frear and Secretary Mellon in regard to the stock dividends recently declared by the Standard Oil companies may foreshadow some legislation that will be designed to make stock dividends taxable.

President Harding's advocacy of a change in the law or an amendment to the Constitution that will close the door to tax exemption and restrict the issue of tax-exempt securities is another evidence of the disposition to widen the incidence of the income tax law that should not be ignored. It may have a very important effect upon the entire security market. Generally speaking, however, there seems every reason to expect a continuance of commercial activity during the winter.

Weekly car loadings of revenue freight based on reports from the railroads of the U. S. by the Car Service Division of the American Railways Association.



Coal Age Index of Bituminous Coal Prices, f.o.b. mines, the average of spot prices from July, 1913, to June, 1914, being taken as the base.



FREIGHT CAR LOADINGS, which began an upward movement in June have continued to mount rapidly upward during September. For the weekly period ending Sept. 2, a total of 931,598 cars were loaded. On Sept. 30, 998,381 cars were reported, the average for the month being 936,386, as against the August average of 887,000. Coal, grain and merchandise loadings continue heavy, with increases in each, and a serious car shortage has developed, reaching 156,309 cars on October 14.

Bituminous coal prices, as indicated by *Coal Age* index, continued their downward movement during September, the average for the month being 412 as against 507 in August, with spot prices for the same periods standing at $5.08 and $6.14 respectively. The month has shown no active demand, buyers being disposed to postpone placement of requirements in the face of declining prices.

Automobile production for September shows a marked seasonal decline from August output, 186,562 passenger cars and 18,843 trucks being turned out as against 249,225 and 24,200 respectively in the previous month. The September total of 205,405 is the lowest since March of the current year but well above the output for the corresponding month of last year in which a total of 178,317 cars and trucks were produced.

Share markets continued their upward movement during September, although the advance was not quite so marked as in July and August. The average of 50 stocks, 25 rails and 25 industrials moved up to 87.85 as against 86.66 in August. The high point during the month was reached during the week ending Sept. 9, on which date the average was 89.47. The critical situation which developed in the Near East weakened the market in the latter part of the month but with a passing of this cloud there has come a recovery. Earnings of high grade rails and industrials continue excellent and regular dividends seem indicated for a considerable period.

Comparative Prices of Shop Supplies

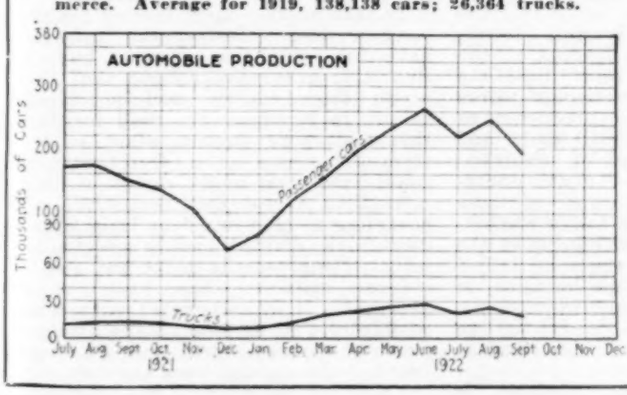
Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.....	$0.0295	$0.0285	$0.0273
Cold finished shafting.....	per lb.....	0.0378	0.0373	0.0379
Brass rods.....	per lb.....	0.171	0.1700	0.148
Solder (½ and ½)	per lb.....	0.23	0.228	0.20
Cotton waste..	per lb.....	0.11	0.11	0.122
Washers, cast iron (½ in.)...	per 100 lb.	4.33	4.33	5.00
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100.....	3.11	3.11	.....
Lard cutting oil	per gal.....	0.575	0.575	.....
Machine oil....	per gal.....	0.36	0.36	.....
Belting, leather, medium.....	off list.....	40–5% @50%	40–5% @50%	
Machine bolts up to 1 x 30 in.	off list.....	55% @60%	50%@ 65–10%	50%@ 60–10%

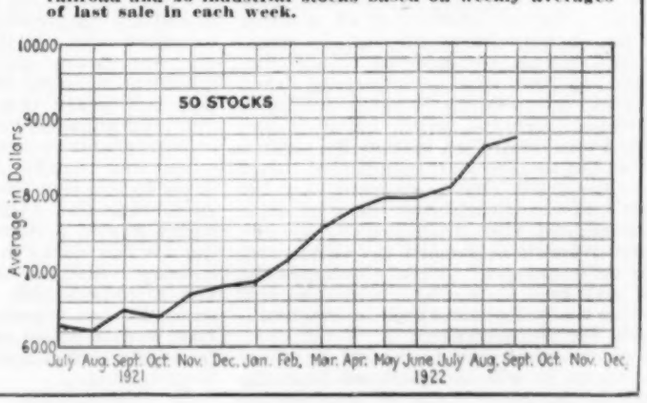
Skilled metal workers are scarce and rates are high. In the New York district tool makers are being paid 75, bench hands and lathe hands 60 cents per hour. Philadelphia reports a range of rates which is wider and somewhat higher, toolmakers receiving from 60 to 90, bench hands 50 to 85 and lathe operators 50 to 90. The Detroit district range for toolmakers is between 75 and 80, bench hands 50 to 55 and lathe operators 70 to 75 cents per hour. Cleveland reports show toolmakers' rates ranging between 50 and 75, bench hands between 40 and 60 and lathe operators between 35 and 65.

Iron castings per pound, based on prices quoted to *American Machinist*, Oct. 27, for 100 flywheels, each of 275 pounds weight and of plain pattern show an average of about 4.9 cents for four cities. New York was highest with 7 cents, and Cleveland lowest with a quotation of 2.4 cents, Chicago and Detroit coming in between, the former quoting a range of 4 to 5 cents and the latter a price of 6 cents per pound.

Passenger cars and trucks, production based on figures compiled by the Bureau of Foreign and Domestic Commerce. Average for 1919, 138,138 cars; 26,364 trucks.



New York Times Annalist combined average price of 25 railroad and 25 industrial stocks based on weekly averages of last sale in each week.



Business Conditions in England

Slow Recovery in Machine Tool Trade—Shipbuilding Outlook Brighter—Textile Machinery Builders Show Prosperity

By OUR LONDON CORRESPONDENT

THE early Autumn has disappointed a number of engineering firms who had expected something better, possibly because the late Summer had not proved so bad a friend to trading as had been anticipated, or perhaps because the Fall of the year and the Spring are commonly supposed to lead to a fresh outburst of activity. Once again enquiries became numerous in the machine tool trade and many firms are again living on hopes.

The small tool trade, if not of normal dimensions, is still not without bulk, though it is to be feared that in some instances the prices obtained have not been remunerative. Everyone is asking, not for the first time, when the machine tool industry will recover, and as this industry has truthfully been described as the handmaid of the rest, it may be well to try to estimate the immediate future of the various branches of the engineering industry generally.

Price and Wage Trend Uncertain

It is fairly evident that some few people are waiting to make sure that prices have really reached a minimum. Whether this is the case in any particular instance depends more largely than usual, because of the restricted demand, on the costs, which certainly show a tendency to decline but not to the extent of other factors that make up price. For instance, apart from national taxation, local rates form a heavy burden on industry and usually do not yet approximate to the decline in prices already manifest. There are makers of machine tools who declare that any change in prices will have to be in an upward direction, if business is to be profitable.

As to engineering wages, few employers will willingly attempt further lowering. The third cut has been made, so that within the last two months or so the weekly rates have dropped by 16s. 6d. It is true that on the shipbuilding side, where the new work commenced during the first half of the year was less than 90,000 tons, a movement has been made for a further reduction of 10s. a week—thus removing the whole of the war bonus. On the other hand, engineering workpeople engaged on textile machinery production have applied for an advance of £1 a week. This, it may be mentioned, is somewhat against the general policy pursued by the chief engineering trade union, who desire wages to move steadily over the whole industry and not to be controlled section by section. Then, again, the view is held that prices of materials have declined to the limit of the present and the immediate future and that should there be any improvement in demand the effect must be an increase of price. Consequently, at any rate in machine tools, the best value likely for some time is now available for the purchaser.

From what has been said in these columns it will be gathered that the textile machinery side of engineering remains in a prosperous condition. This has been true for two or three years, but it is highly improbable that the enquirer will now be met, as he has been met in the past, by a quotation of three years' delivery. It would seem rather that the export orders which have kept this section of engineering in such a happy condition are being worked up; on the other hand, it is with confidence anticipated that the home demand will improve.

It is a fact that from the manufacturer to the repairer of textile machines and details a state of full activity prevails, and even a well-known firm of chain makers has to some extent entered the field. Some indication of the position is given in the report, recently issued, of Dobson & Barlow, Ltd., Bolton, the profit declared for the year 1921-1922, amounting to £266,512, as against £93,626 for the twelve months previous and £91,253 the year before that. The latest dividend is at the rate of 30 per cent and £135,000 is carried to reserve, which amounts to £300,000, the issued ordinary capital being £200,000.

> British industry has been passing through the most severe depression ever recorded in its history. Depending almost entirely upon its overseas trade, the world depression has affected its industrial and economic life in a manner which is difficult to estimate. Here and there bright spots are beginning to appear and a settlement of the question of interallied debts will do much to establish equilibrium and place the nation once more in the front rank of America's customers abroad.

Electrical Firms Show Improvement

Probably electrical engineers are in the next position of prosperity, though it will not have escaped notice that the Coventry works of the English Electric Co., are closing down, leading to the discharge of some 800 men. Until the last few years this particular works has been engaged on the production of ordnance and certain small tools, and when the combination of electrical firms named was effected it was understood that the main purpose of these shops was to undertake heavy machining for the works in other parts of the country. Still, in the electrical industry a considerable scope remains in connection with power houses and traction, and if prices can be adjusted the prospects cannot fairly be described as unpromising.

In shipbuilding the outlook is brighter than it has been. A few orders have recently been placed on the Clyde and elsewhere but it is understood that they have in several instances been contingent on the further wages reduction. Ship-repairing has not been in so bad a case. The marine engineering branch is almost as slack as any other, and the directors of Parsons Marine Steam Turbine Co., for example, report great difficulty in obtaining orders for marine turbine installations; they show profits of £34,198 against £42,581 in the preceding 12 months. The indications of improvement in agricultural engineering are not specially marked.

In the automobile world the dead season is of course being entered. Much, some people think too much, is being hoped from the very definite price reductions, not only of motors themselves but also of such details as tires, petrol, etc., and the general tendency is shown by the introduction of a 20 hp. Rolls-Royce car to take its place alongside the higher-power vehicle.

Seasonal Decline in Autos

A Coventry firm recently paid 40 per cent, but losses continue to be reported. The Vulcan Motor & Engineering Co., a Southport section of the Harper-Bean combination, for example, followed the payment of 30 per cent free of income tax for five successive years with a loss of £434,261 in 1920 and one of £421,205 in 1921: the total loss however is reduced by excess profits duty remitted and reserves written back to the total of £454,560. The report of the Star Co., Wolverhampton, shows a loss of £58,453—ascribed to the abnormal conditions of trade and depreciation of stock—so that once again no dividend is paid. The Ford Co., it is understood, have acquired land near Southampton, where, it is stated, the buildings will cover about 20 acres, the output being 200 cars a day as against 160 at Trafford Park now. Southampton is, in fact, to become the distributing centre not only for Great Britain but also for Europe. The commercial vehicle side is clearly in a depressed condition and, as in the case of pleasure cars, to a marked degree debentures and similar papers have necessarily been taken as payment by suppliers of material.

To take another large market for the machine tool industry, the railways have for some time stopped buying. But it is generally thought that this arises from caution and not from faliure to recognize the need for further and more modern plant in the form of machine tools. Our numerous small lines must in the course of little more than a year sort themselves out according to plan into four large amalgamations, divided mainly geographically. The process is under way and in several instances has made rapid progress. It is anticipated with some confidence that as soon as the amalgamations are completed, and the engineers of the various lines know exactly the position, the machine tool trade will

be called on. The amalgamations are of course to be effected in view of economy, and it is quite possible that some of the small shops, and even the larger works, belonging to the different lines will find their occupations gone. On the other hand, the need for improved methods of machining is quite well recognized, and it is in this direction that the machine tool man will turn most hopefully in surveying the future. But any demand is hardly likely to show itself for some months. Railway rolling stock builders are reporting increased profits. Hurst, Nelson & Co., Motherwell, show a profit of £106,575 as against £94,230, and Kerr, Stuart & Co., Ltd., indicate net profits at £62,824.

For the present the radio industry languishes. Two exhibitions have been held in London, one almost on the heels of the other, and they have been well attended, particularly by schoolboys and youths. But broadcasting arrangements are incomplete, and the license fees to be paid to the postmaster-general are not yet settled.

TOOL BUILDERS ENTER NEW FIELDS

The machine tool industry remains very poorly occupied and the possibility is that, provided satisfactory arrangements can be made as regards the building, the next exhibition to be organized by the Machine Tool Trades Association will be held in 1925 rather than 1924. Two or three relatively small firms can be mentioned as being fairly well engaged; they are concerned with special tools for textile machinery makers. As for many months past, makers of standard tools in quantities are the firms least likely to receive orders. Little that is definite is available regarding the financial position. One firm, at any rate, after about paying its way for the two previous years, according to its latest report made a loss during the past 12 months of some £6,000 on trading transactions totalling about £55,000. The individual members of the machine tool industry, in fact, have had to look in other directions for business and have turned their hands of late—to mention some instances—to the production of small engines for agricultural purposes, to printing machinery and to cleaning appliances for tennis balls. Armstrong, Whitworth & Co., Ltd., are now manufacturing road rollers, steam- and oil-driven, and other road-making machinery, the Openshaw works thus again taking up a branch of engineering initiated there nearly 70 years ago by Joseph Whitworth, who built a road sweeper on the conveyor and hopper principle.

As it has been stated, the weekly wages rates of engineering workmen have been reduced by 16s. 6d., and employers and employed have been in conference over systems of payment by results, but without agreement, that is without agreement as regards the ordinary machine shop. Certain of the trade unions of foundry workers and pattern makers have accepted the proposals of the employers, who have now intimated to the other engineering work people that they consider themselves free to introduce such systems as they find necessary. They agreed at the termination of the last dispute not to introduce anything of the kind for at least one month. This of course applied to proposed new schemes, as piecework in certain districts is exceedingly common.

A joint investigation committee of employers and trade union representatives indeed has been considering the whole subject, having, according to a preliminary statement, inspected in detail 32 engineering and shipbuilding organizations in the United Kingdom, 11 in Belgium, 4 in Germany and 7 in Holland, and it is understood that the advisability is being considered of visiting America for the same purpose. An agreed statement of a private character has been drawn up, but some at least of the details have been made public, from which it is gathered, in comparing outputs on time and piece work rates, that the fitting of certain water-tight shutters took 490 hours in one case on time rates and 150 hours when the pay was by results. Similarly a ship built on time rates took 2,601 hours, while a similar ship on the payment-by-results system was finished in 1,151 hours. Riveters on time dealt with 176 rivets as against 722 rivets on piece, and so on. Individual rather than collective systems of payment by results seem to have proved the better. The investigation arose out of the demand about three years ago for a 44-hour week, now seemingly forgotten.

The figures issued of national revenue and expenditure suggest that the Budget forecast can be borne out, provided of Course Great Britain keeps clear of war. For the first six months the revenue amounted to nearly 404 million pounds, the total decrease being lower than was estimated. In the same period the expenditure was rather less than 347½ million pounds, proportionally a still larger decrease, the revenue thus showing a surplus over expenditure of nearly 56½ million pounds. Without going into details it may be said that the revenue figures suggest the complete breakdown of the excess profits duty, less than a million pounds having been received on this account out of a total of nearly 28 millions which, it was estimated, would be received for the complete fiscal year. Officially reported unemployment continues to decline somewhat, while the cost of living shows a slight decrease.

Hoffmann Bearings to Be Made in America

The Norma Company of America, Anable Avenue, Long Island City, N. Y., has acquired the American patents and business of the Hoffman Manufacturing Co. of Chelmsford, Essex, England, makers of "Hoffmann" roller, ball and thrust bearings. The line of "Norma" Precision Ball Bearings will now be supplemented with "Hoffmann" Precision Roller Bearings.

The "Hoffmann" Roller Bearing has long held, abroad, the same repute which high-precision standards have given the "Norma" Ball Bearing in America. For the past year the Norma Company has thoroughly investigated the American market for roller bearings of this high quality, and has found a distinct demand for high-grade units.

The Norma Company will erect a a new plant for the manufacture of "Hoffmann" products in America. Meantime, they are being imported and sold under the regular "Norma" engineering service.

Ryerson Celebrates 80th Anniversary

Eighty years ago, on the first day of November, there arrived in Chicago from Pittsburg, Joseph T. Ryerson, the accredited agent of Wood, Edwards and McKnight. It was during that period in America's economic development known as the fifth stage, the period in which a great westward movement of population took place.

The population of the then gateway to the west was about 6,000 with a few buildings of brick and more of a rude frame structure, nearly all ranged along the water front.

Here in 1842 Joseph T. Ryerson laid his foundation. He rented a little store and started in the iron business with a small stock from Pittsburg. The steady westward movement and the ever increasing population of Chicago compelled him, two years later, to buy land and build a two story structure on Lake Street. By 1852 the location, due to the spread of the dry goods district, became unsuited to the iron business. A site was purchased on South Water Street on the river. Here, until the great fire in 1871 reduced it to ashes, the business grew and prospered. By March, 1872, one year later, it had been rebuilt on Clinton Street and business was again under way. Ten years later the premises was again enlarged, and when, in 1883, Mr. Ryerson died, the administrative direction of the business, already grown to no mean size and now known as Joseph T. Ryerson & Son, fell upon the shoulders of his son, Edward L.

Steadily through depressions and panics it has grown until today the small frontier iron store, started in 1842, occupies a ground area of 19 acres in Chicago alone. Linked to this central point in the system have been added the plant of the W. G. Hagar Iron Co., St. Louis, Mo.; a warehouse in New York, a plant in Detroit completed just prior to America's entrance into the war and the warehouse of the Ferguson Steel and Iron Co., Buffalo, purchased in 1919.

The business stands today as a happy outgrowth and a monument befitting the restless energy so characteristic of America's early pioneers. The celebration of its 80th anniversary, coming as it does on the threshold of a new era of sound prosperity, is an event of which the company's executives may well feel proud.

Engineers Discuss Management

Management in all its various phases was discussed by managers of national reputation at the two "Management Week" meetings held at the Auditorium Hotel in Chicago, Oct. 18 and 20. The following papers were presented: Application of Scientific Management, by A. M. Simon, American School of Correspondence; Management and the Human Factor, by John Calder, Supt. of Industrial Relations, Swift & Co.; Personal Aspect of Management, by Hugo Diemer, LaSalle Extension University, and What Is Management Control, by W. H. Leffingwell, Pres., Leffingwell Ream Co., Management Engineers, New York City.

Organization Changes of the Dodge Manufacturing Corporation

Among the changes that have recently taken place in the organization of the Dodge Manufacturing Corporation, Mishawaka, Ind., we note the following:

President, Melville W. Mix; vice-president, W. B. Hosford, treasurer, Charles Endlich; assistant treasurer, W. L. Chandler; foundry superintendent, Harry Bell and Mr. Mix's son, publicity manager, have retired.

It is understood that Mr. Mix sold his interest for $1,500,000 and that Messrs. Hosford and Bell have been given life pensions.

Charles F. Morse, a well known corporation attorney of Chicago and Mayor William W. Dodge, of Mishawaka, holder of the controlling interest in the company, have been elected president and vice-president, respectively.

Business Items

The Dover Machine Co., Pawtucket, R. I., manufacturer of machinery, etc., during the past week changed the name of the concern to the Henry A. Goodrich Co., and have moved the plant to East Providence, R. I., where they will be better equipped.

Peters & Russell, Inc., of Boston, Mass., has been incorporated and organized under the laws of Massachusetts, to deal in all kinds of buffing and polishing wheels, machinery, etc. The capital stock is $50,000, and the officers chosen are: Paul A. Peters, president; Frank H. Russell, 75 Park St., West Roxbury, Mass., treasurer; and Donald L. Whittemore, director.

The American Pipe Tool Co., 123 South Jefferson St., Chicago, is the name of a new concern recently organized by W. H. Gabel, formerly general manager of the Crown Die and Tool Co. of that city. The company will engage in the manufacture of a line of pipe tools and is introducing at the present time the "American" portable pipe vise stand.

The American Adjustable Chase Co., Inc., 43 Water St., Torrington, Conn., was incorporated and organized during the past week under the laws of Connecticut, to engage in the general manufacturing business. The capital stock of the company is $75,000, and the incorporators are: Daniel F., William A. and John H. Burns. Daniel F. Burns has been chosen president; John H. Burns, secretary, and William A. Burns, treasurer.

The Gulf States Steel Company for the quarter ended Sept. 30, 1922, reports net operating income of $340,287. Net income, after taxes, depreciation and other charges, amounted to $252,284.

The Consolidated Tool Works, Inc., 266 Broadway, New York City, announces the following appointments in its sales personnel: Wm. H. Thompson, formerly with the Union Hardware Co., Torrington, Conn., will be its representative in New York City; Charles Alburtus, formerly with the American Safety Razor Co., Brooklyn, N. Y., will represent it in New Jersey; Howard A. Postley, formerly with the Knickerbocker Manufacturing Co., Belleville, N. J., is appointed to represent it in the New England States, and Wm. I. Rubin, formerly with the Jacobs Scale Co., New York City, is appointed its representative in New York, Pennsylvania, Maryland, District of Columbia, and parts of West Virginia and Ohio.

The Bethel-Player Co., Westboro, Mass., has been formed for the purpose of marketing the Fraser automatic grinder, tapping machines and metal products. Mr. S. Player was formerly production manager of the Taft-Pierce Manufacturing Co., and later general manager of Warren F. Fraser Co. J. N. Bethel was also long associated with the Taft-Pierce Co. and sales manager of the Warren F. Fraser Co.

The Packard Motor Car Co. reports September earnings amounting to $900,000 with $16,000,000 cash and marketable securities on hand.

The Lima Locomotive Works directors have declared a dividend of $1 a share quarterly on the new common stock without par value, thus placing the stock on a $4 annual dividend basis.

The Precision and Thread Grinder Manufacturing Co., 1 South 21st St., Philadelphia, Pa., is now under the direction of A. T. Doud, president of the company, who purchased the capital stock formerly held by members of the Hudson Motors Specialty Co. of Philadelphia. The two companies are no longer affiliated. Mr. Doud has been in charge of the Precision and Thread Grinder Manufacturing Co. since the early part of July, 1922, but the deal was not consummated until the latter part of September.

The Seaboard Air Line Railway Co. has been granted authority to issue $2,560,000 of equipment trust certificates, the proceeds to be used to purchase three freight locomotives, 1,250 wooden boxcars, 900 steel underframe boxcars, 850 underframe drop bottom gondola cars, and 100 all-steel phosphate cars.

G. E. Osborne of Wichita, Kan., will open a machine shop at 433 Wabash Ave., in that city Nov. 1, where he will conduct a general machine shop business and install modern machinery.

The Biltwell Factories, Wichita, Kan., has taken over the Western Furniture and Manufacturing Co., located at 1414 S. Washington Ave., in that city and will install various new machinery and machine tools. C. W. Rogers is manager.

The National Enameling and Stamping Co. has broken ground at Granite City, Mo., for its new $1,500,000 plant. The plant will contain six sheet mills and one jobbing mill.

The Rudolph Jiffy Tool Co., Eau Claire, Wis., is the name of a new company recently incorporated in that city to manufacture a line of mechanics' tools and auto specialties.

Alvord Reamer and Tool Co., Millersburg, Pa., announces the appointment of C. C. Strout in the capacity of vice-president, in charge of sales. Mr. Strout was formerly connected with the Victor Saw Works, as Western Sales Manager, and with the Safety Wrench and Appliance Co., as general sales manager. This company also announces the formation of a service department in connection with their engineering department, under the direction of A. M. Lindsley, chief engineer, which will function by supplying consulting service in connection with special tool equipment.

The Allis-Chalmers Manufacturing Company reports net profits after Federal taxes for the quarter ending June 30 of $299,796.

The Burdick-Atkinson Corporation is the name of a new concern recently established at Hamburg, N. Y., to manufacture wire springs for use in automobile upholstery. John S. Burdick, the incorporator, is president and general manager and associated with him are Frederic R. Atkinson, vice-president; Franklin R. Brown, treasurer and Harry Burdick, secretary.

The White Motor Co. is reported to be planning the establishment of a branch factory at Chattanooga for the manufacture of trucks.

The Western Specialty Manufacturing Co., capitalized at $32,000, filed articles of incorporation in Vancouver, Wash., recently. The company will manufacture automatic lock-nuts. The incorporators are C. F. Kletsch, C. R. Catlin and B. E. Hawley, all of Kelso. The principal place of business of the firm will be at Vancouver.

The American Machine and Foundry Co. directors have declared a stock dividend of 200 per cent, payable Nov. 15, to stock of record Oct. 19.

The Trexler Co. of America, manufacturer of auto accessories, has taken over the Wilmington plant of the Artillery Fuse and Standard Arms Co.

The Decker Manufacturing Co., Brockport, N. Y., manufacturer of power spray outfits, has been sold to E. H. Norton, who has been associated with the company as salesman. Mr. Norton will continue the business.

The Hartford Tap and Gage Co., Hartford, Conn., has changed its name to Hanson Tap and Gage Co.

The Dolman Manufacturing Co., is the name of a new corporation recently incorporated at Springfield, Mass., to manufacture a line of small tools, the first of which, the Dolman screw driver, has recently been placed on the market. The organizers are Guy W. Donahue, William F. Pollock and Chester C. Jackman, all formerly associated with the Victor Saw Works, Inc., Middletown, N. Y.

Personals

PETER PARKE, chief engineer of the Pullman Co., has been transferred to the department on improvements and economy covering investigations into modern methods and machinery.

E. W. TEST of the Michigan city plant of the Pullman Co. has taken over the duties of Peter Parke with the title of general mechanical engineer.

EDWARD T. PETERSON, formerly of the organization of the Treadwell Engineering Co. has been appointed chief engineer of the Birdsboro Steel Foundry and Machine Co. Birdsboro, Pa.

MAYOR ALBERT PETER, until recently with the Chain Belt Co., Milwaukee has been appointed chief engineer and works manager of the Milwaukee Air Power Pump Co.

E. W. SMITH has been appointed general superintendent of motive power of

the Southwestern region of the Pennsylvania Railroad with headquarters at St. Louis, Mo.

H. H. COLBUS has joined the sales staff of the Down Tool Works, Inc., Fleetwood, Pa., and will represent the company in the Philadelphia district.

G. C. BAUMAN, formerly with the Rich Tool Co., Chicago, has accepted a position as superintendent of the Ward Tool and Forging Co., Latrobe, Pa.

JOHN E. SNYDER of J. E. Snyder and Son, Worcester, Mass., vertical drilling machine builders, returned recently from a trip to England and the continent.

NELSON C. JOHNSON, secretary of the Foster, Merriam & Co., manufacturer of hardware, etc., Meriden, Conn., has recently been chosen the treasurer of the company also. Mr. Johnson succeeds John A. Ross, who resigned his position as treasurer during the past week.

CHARLES C. RAMSDELL, vice-president of the Gilbert & Barker Manufacturing Co., West Springfield, Mass., was recently presented with a 30-years' Service Pin in honor of his thirty years of service in the Gilbert & Barker organization. Mr. Ramsdell entered the employ of the firm in August, 1892, and has worked his way up from New York salesman to the present position.

R. I. CASE, until recently associated with Eccles & Smith Co., San Francisco, machinery dealers, has been appointed manager of the machinery department of the Berger & Carter Co.

CHARLES E. STAHL, vice-president, assistant general manager and sales manager of the Connecticut Telephone and Electric Co., manufacturer of telephones, systems, tools and electrical goods, etc., of Meriden, Conn., during the past week resigned his positions with the company. Mr. Stahl has been with the firm for the past ten years.

HENRY A. TREMAINE has been elected president and general manager of the Grant-Lees Co., manufacturer of motor car and truck transmissions.

REGINALD W. MILLARD, president of the Foster, Merriam & Co., manufacturer of hardware, etc., Meriden, Conn., has recently resigned his position with the company. Mr. Millard is succeeded by Howard E. Boardman of New York City as president, Mr. Boardman having been chosen at a directors' meeting held during the past week.

F. E. BOOTH has been appointed sales manager of the motor bearings division of the Hyatt Motor Bearing Co.

VAL A. BROWNING, son of John M. Browning, inventor of the machine gun bearing his name, arrived in this country recently from Belgium where he is consulting expert for the Fabrique Nationale, Heerstal, Belgium, and will pay his father a visit in Hartford, Conn.

R. H. BECKER, formerly connected with the machine tool building and sales department of Joseph T. Ryerson and Son, is now with the Milwaukee Machinery Co., 93 West Water St., Milwaukee, Wis. He will have charge of machine tool sales in part of the Milwaukee and southern Wisconsin territory.

Obituary

A. J. BEATON of the Beaton & Cadwell Manufacturing Co., manufacturer of metal novelties, air valves, etc., died at Norwood, Mass., Oct. 21, at the age of 74 years. Mr. Beaton was also at one time connected with the A. J. Beaton Co., and the Beaton & Corbin Co., both of New Britain.

CHARLES GLOVER, president, the Skinner Chuck Co., New Britain, Conn., and one of the best known manufacturers of screws in the country, died at his home in New Britain Oct. 25 after a long illness. Mr. Glover was 75 years old and was prominent in industrial circles throughout the eastern states. He was a former president of the Corbin Screw Corporation, a director of the American Hardware Association and a director of the New Britain National Bank.

Book Reviews

Statistical Abstract of the United States for 1921. Compiled by Edward Whitney. Published by the Bureau of Foreign and Domestic Commerce, Washington, D. C. Price 75 cents (paper cover).

The forty-fourth number of the Statistical Abstract of the United States, for the year 1921, contains 942 pages, including a complete index.

The publication is an exhaustive compilation of statistical information embracing every branch of the governmental service. A total of 497 separate tables are contained in the volume setting forth up-to-date data on a great variety of subjects.

Some idea of the scope of the work may be gathered from the following sub-titles appearing in the contents pages:

1. Area, Climatic Conditions and Position.
2. National Parks, Reservations and Public Lands.
3. Irrigation and Drainage.
4. Population.
5. Vital Statistics.
6. Immigration and Passenger Movement.
7. Education and Vocational Rehabilitation.
8. Farms and Farm Property.
9. Farm Animals and Products.
10. Farm Crops.
11. Fisheries.
12. Minerals and Products.
13. Manufacturers.
14. Industrial Accidents and Fatalities.
15. Commercial Failures.
16. Public Roads and Motor Vehicles.
17. Postal Service and Telegraphs.
18. Railroad and Express Companies.
19. Freight Rates and Commerce.
20. Merchant Marine.
21. Commerce of Noncontiguous Territory.
22. Consumption Statistics.
23. Prices.
24. Money and Banking.
25. Obligations due the U. S. Government.
26. Revenue and Expenditures.
27. Insurance and Fires.
28. Public Debt.
29. Wealth and Taxation.
30. Army, Navy, Civil Service, Pensions, etc.
31. Statistical Record of the Progress of the U. S.
32. Commercial, Financial and other Statistics of the World.

The book is an excellent reference guide and forms a valuable supplementary aid to the various newspaper almanacs.

Modern Workshop Practice. By Ernest Pull. Sixth edition, rewritten and enlarged. Cloth; six hundred and seventy-one 5¼ x 8 in. pages, 552 illustrations. Published by D. Van Nostrand Co., 8 Warren St., New York City. Price $5.

This book was written by the workshop superintendent of the London (England) County Council School of Engineering and Navigation for the use of students in technical institutes and candidates for examination and entry into the Royal Navy as engine room artificers. Various types of machine tools and shop appliances are illustrated and described and some little instruction given in their use.

As a whole, the practical information contained is but little more than that given in first class advertising matter of tool builders. Regarded as a catalog of machine tools and their accessories, the book may be fairly complete from an English point of view, but it fails to meet the American standard in that class of publications. The book having lived through six editions, however, it must have some popularity among British mechanics.

Trade Catalogs

Drafting Tools. E. Lawrenz, 2533 McClellan Ave., Detroit, Mich. A new bulletin has just been issued by this manufacturer describing his line of "The Normal" drafting tools to which has been added a set of bow compasses.

Triplex Machines. The Triplex Machine Tool Corporation, 18 East 41st St., New York City. This company has just issued an interesting circular describing fully its Triplex machine, a small machine of 500 pounds weight, which is adapted for turning and boring, angular and vertical milling, horizontal milling, thread cutting and drilling. The circular contains illustrations showing the various operations.

Coxe Stokers and CEC Service. The Combustion Engineering Corporation, Broad St., New York City. This company has just issued two new publications. The larger bulletin on the Coxe stoker covers particularly the performance of this stoker on Western and Mid-Western bituminous coals. A number of test reports, each accompanied by corresponding curves are included. These tests show interesting results and because they are complete in every respect they will be of considerable value to the engineering world. A number of successful installations in some of the biggest and most important plants in the Middle West using this type of stoker on bituminous coal are shown in this bulletin. The "Service Bulletin," while it is issued by this company, will be of value to all stoker companies. At the present time it is necessary for stoker manufacturers to render gratuitously, service of a very costly nature. This booklet presents the stoker manufacturers' side of the question and shows why a proper charge for real stoker service would not only be fair to the recipient but would be to his advantage.

Forthcoming Meetings

National Personnel Association, First Annual Convention, November 8, 9 and 10, at Pittsburgh, Pa. Secretary at 20 Vesey St., New York, N. Y.

Automotive Equipment Association. Annual show and meeting, November 13 to 18, Chicago, Ill.

National Founders' Association, Nov. 22 and 23. Secretary, J. M. Taylor, 29 South LaSalle St., Chicago, Ill.

Eighteenth Annual Automobile Salon, Commodore Hotel, New York City, December 3 to 9, 1922.

American Society of Mechanical Engineers, annual convention, December 4 to 7, 1922, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

National Exposition of Power and Mechanical Engineering. Dec. 7 to 13, 1922, Grand Central Palace, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

National Automobile Chamber of Commerce, National Automobile Show, Grand Central Palace, New York City, January 6 to 13, 1923.

National Automobile Chamber of Commerce, National Automobile Show, January 27 to February 3 1923, Coliseum and First Regiment Armory, Chicago, Ill.

American Engineering Council, Annual Meeting, January 11 and 12, at the headquarters of F. A. E. S., 24 Jackson Place, Washington, D. C. L. W. Wallace, Secretary.

American Institute of Electrical Engineers, Mid-Winter Meeting, February 14 to 16. Engineering Societies Bldg., New York. F. L. Hutchinson, Secretary.

American Institute of Mining and Metallurgical Engineers, Annual Meeting, February 19 to 21. Engineering Societies Bldg., New York. F. S. Shartless, Secretary.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Reduction of two points in wrought-steel pipe discounts in New York and Cleveland warehouses, following recent mill advance of $4 per ton. Steel plate demand for car, tank, ship and boiler construction, in excess of production. Plates quoted at minimum of $1.90, with maximum at $2.25, or an average price of about $2 per 100 lb., f.o.b. Pittsburgh. Shapes quoted, however, at $2@$2.10 and bars at $2@$2.15, f.o.b. mill. Tin market active; quoted in New York warehouses at 37c. as against 35c. per lb. Lead, 6.95c. as compared with 6¾c.@6¾. last week, and zinc firmer at 7⅛c. as against 7⅜c. Zinc sheets up ¼c.; solder and babbitt metal 1c. per lb. in New York, during week. Cleveland advances antimony ¼c.; babbitt metal 1c. and old metals, non-ferrous, ¼c. per lb.

Declines—Copper market softer but inquiries better; quoted at 14¼c. as against 14⅜c. per lb. in New York. Coke prices lower; decline expected in pig iron. Cast-iron washers down $1 per 100 lb. in Cleveland. Linseed oil quiet; down 3c. per gal. in Chicago. Improvement in demand for lard oil and lubricants but prices unchanged.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$31.55
Northern Basic	33.27
Southern Ohio No. 2	33.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	35.80
BIRMINGHAM	
No. 2 Foundry	27.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	32.64
Virginia No. 2	37.17
Basic	31.75
Grey Forge	30.50
CHICAGO	
No. 2 Foundry local	32.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	33.50
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	31.77
Basic	31.77
Bessemer	33.77

IRON MACHINERY CASTINGS—Cost in cents per l b. of 100 flyhweels, 6-in. wide x 24-in.o.d., hub not cored, good quality gray iron, weight 275 lb.:

New York	5½
Chicago	4@5
Cleveland	2.4
Detroit	6.0

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50@2.85	4.19	3.70	4.00
No. 12	2.60@2.95	4.24	3.75	4.05
No. 14	2.70@3.00	4.29	3.80	4.10
No. 16	2.90@3.30	4.39	3.90	4.20
Black				
Nos. 17 and 21.	3.20@3.60	4.70	4.20	4.70
Nos. 22 and 24.	3.25@3.65	4.75	4.25	4.70
Nos. 25 and 26.	3.30@3.70	4.80	4.30	4.75
No. 28	3.35@3.75	4.90	4.40	4.85
Galvanized				
Nos. 10 and 11.	3.35@3.85	4.90	4.40	4.85
Nos. 12 and 14.	3.45@3.95	5.00	4.50	4.95
Nos. 17 and 21.	3.75@4.25	5.30	4.80	....
Nos. 22 and 24.	3.90@4.40	5.45	4.95	5.40
No. 26	4.05@4.55	5.60	5.10	5.55
No. 28	4.35@4.85	5.90	5.40	5.95

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	66	54½	¾ to 1¼	34	19
		LAP WELD			
2	59	47½	2	29	15
2½ to 6	63	51½	2½ to 4	32½	19
7 to 8	60	47½	4½ to 6	32½	19
9 to 12	59	46½	7 to 12	30	17
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	64	53½	¾ to 1¼	34	20
2 to 3	65	54½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	57	46½	2	30	17
2½ to 4	61	50½	2½ to 4	33	21
4½ to 6	60	49½	4½ to 6	32	20
7 to 8	56	43½	7 to 8	25	13
9 to 12	50	37½	9 to 12	20	8

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	57%	44%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	54%	41%	53½%	40½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 6%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods(base)	6.03	8.00	6.10
Hoop steel	4.39	3.71	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.16	5.50
Cold finished shafting or screw	3.90	3.75	3.70
Cold finished flats, squares	4.40	4.25	4.20
Structural shapes (base)	3.14	3.01	3.02½
Soft steel bars (base)	3.04	2.91	2.92½
Soft steel bar shapes (base)	3.04	2.91	2.92½
Soft steel bands (base)	3.84	3.61	3.55
Tank plates (base)	3.14	3.01	3.02½
Bar iron (2.60 at mill)	3.04	2.91	2.82½
Drill rod (from list)	55@60%	40%	50%
Electric welding wire:			
⅝	8.00		12@13
½	6.50		11@12
5/16 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.50
Tin, 5-ton lots, New York	37.00
Lead (up to carlots), St. Louis	6.45@6.50; New York, 6.95
Zinc (up to carlots), St. Louis	7.05@7.10; New York, 7.5

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	20.70	23.00	20.00
Antimony (Chinese), ton spot	7.25@7.37½	8.50	8.00
Copper sheets, base	21.50	22.00	23.00
Copper wire (carlots)	16.00	18.00	16.25
Copper bars (ton lots)	20.00	23.00	19.50
Copper tubing (100-lb. lots)	24.75	25.00	23.00
Brass sheets (100-lb. lots)	18.50	20.75	18.75
Brass tubing (100-lb. lots)	23.00	24.00	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	17.00	18.75	15.75
Brass wire (carlots)	19.00	20.75	.....
Zinc sheets (casks)	9.75	10.25	.....
Solder (½ and ½), (caselots)	26.50	23.50	20.00
Babbitt metal (83% tin)	35.00	45.00	36.00
Babbitt metal (35% tin)	25.00	17.25	9.00
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J	39.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.75	12.00
Copper, heavy, and wire	11.75	12.25	11.50
Copper, light, and bottoms	9.75	10.25	10.50
Lead, heavy	4.75	5.25	4.75
Lead, tea	4.25	4.25	4.00
Brass, heavy	7.00	6.50	9.25
Brass, light	6.00	5.75	6.00
No. 1 yellow brass turnings	6.50	7.00	7.00
Zinc	3.00	4.00	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
	Coke Plates, Bright			
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
	Terne Plate			
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.09@$0.11½	$0.12	$0.11½
Cotton waste, mixed, per lb.	.065@.10	.09	.08
Wiping cloths, 13½x13½, per lb.	.16	32.00 per M	.10
Wiping cloths, 13½x20½, per lb.	.20	48.00 per M	.13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.93	1.01	.94
White lead, dry or in oil	100 lb. kegs.	New York,	12.75
Red lead, dry	100 lb. kegs.	New York,	12.75
Red lead, in oil	100 lb. kegs.	New York,	14.25
Fire clay, per 100 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$8.00	
Coke, prompt foundry, Connellsville	per net ton	10.50@12.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	40%	50-10-5%	50%
1⅛ and 1¼x3 in. up to 12 in	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in	30%	40-10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ⅛ in., per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ¼ in. per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, ⅞ in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1⅛ to 1½-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55-5%	50%	50%
Copper burs	35%	50%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	40-5%	40½%	50%
Heavy grade	30-5%	30-5%	40-5%
Rubber and duck:			
First grade	60-5%	50-15%	40-10%
Second grade	65-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

Conn., Danbury—J. W. Leahy, 29 Crosby St., (machine works)—one ⅞ in. and one 1¼ in. model B Cleveland automatic screw machines.

Fla., Marianna—Consolidated Motor Co., L. Williams, Secy.—machine shop equipment.

Ill., Chicago—The Chicago & Northwestern Ry. Co., F. G. Berck, Boone, Ia., Purch. Agt.—one 42 in. drill press; one 15 in. drill press; two 18 in. engine lathes, 4 ft. between centers; two 20 in. engine lathes, 6 ft. between centers; two hollow hexagon turret lathes, Warner & Swasey No. 2 A universal or equivalent; one centering machine for 3 in. stock; one large quick work power hammer with set of dies; one spot welding machine, equal to No. 254 Thompson Welder Co. machine to weld No. 22 to No. 3 B. & S. gauge iron and steel; three double dry grinding emery wheel stands with 2 x 18 in. wheels and 1¼ in arbors; also three power hack saws, Marvel No. 4.

Ill., Chicago—J. A. Dunn Co., 2911 South LaSalle St. (manufacturer of chairs)—one Hawker, dowel turning machine (used).

Kan., Wichita — Garry Sales Co., 315 South Market St., T. H. Cooper, Purch. Agt.—complete equipment for garage, including drill press, lathe, emery stand, hangers, bearings, shafting, pulleys and small tools.

Mass., Boston—J. L. Gleason & Co., 241 Franklin St., (electrical contractors), J. L. Gleason, Mgr.—several electric drills for shop work (used).

Mass., Boston—G. G. McLaughlin Mfg. Co., 24 Washington St., N. (machine shop)—one 12 in. four sided moulder (used).

Mass., Boston—M. Strauss, 53 Merrimac St., (sheet metal worker)—automatic punch, automatic shears, squaring shears and electric drill (used).

Mich., River Rouge—Whitehead & Kales Co. (structural steel)—spacing machine, punch, angle shear for large sizes.

Mo., St. Louis — Lubrite Refining Co., 1812 Arcade Bldg.—pipe cutting machine, from 1 to 6 in. capacity, with die, belting and shafting.

Mo., St. Louis—Western Screw Products Co., 3219 South Bway.—automatic and hand screw machines, engine lathes, carbonizing outfit, oil extractor, drill presses, nut tappers, McKenzie chip and product separator and computing scales (new or used).

N. Y., Buffalo—J. H. Aspden, 312 Niagara St.—machinery and equipment for automobile repair and machine shop on South Park and Woodside Aves.

N. Y., Buffalo—Birk-Notman Motor Co., 1079 Hertel Ave.—machinery, tools and equipment for proposed $30,000 garage and service station.

N. Y., Buffalo—A. J. Hansen, 185 Goodell St.—equipment for automobile repair shop.

N. Y., Buffalo—M. Katz, Ellicott Sq.—machinery, tools and equipment for automobile service station and repair shop at 1443 Main St., rear.

N. Y., Buffalo—H. H. Masters, 87 Virginia Pl.—machine shop equipment.

N. Y., Buffalo—C. S. McDonough, 1148 Niagara St.—equipment for garage, including 1,000 gal. gas tank and pump.

O., Cleveland—Bd. Educ., Rockwell Ave. and East 6th St.—squaring shears, bar folding machine, punch and shear combined, burring machine, turning machine, woodworking machinery and miscellaneous shop equipment for John Adams Sr. High School.

O., Columbus — The Althoff Plating & Polishing Co., 212 North Grant Ave., J. G. Althoff, Purch. Agt.—polishing equipment and bending machine.

O., Columbus—The Ohio State Stove & Mfg. Co., foot of Buttles Ave., M. L. Packer, Genl. Mgr.—automatic press, 20,000 lb. capacity, also equipment for addition to plant.

Pa., Ambridge—H. H. Robertson Co.—multiple punching machine for 18 guage metal.

Pa., Pittsburgh — Guibert Steel Co., Diamond Bk. Bldg. (steel fabricating), E. R. Bechtel, Purch. Agt.—punches, shears and boring machinery.

Tenn., Knoxville — The Cherokee Motor Co., 314 State St., C. Reed, Pres.—equipment for proposed addition to garage and service station.

Tenn., Union City—W. Warmuth (sheet metal worker)—one set of power sheet bending rolls.

Tex., Columbus—Gimmer Tanner Gravel Co.—machine and forge shop equipment to replace that which was destroyed by fire.

Va., Richmond—Night & Day Service Co., 900 West Broad St., C. B. Hatch, Purch. Agt.—lathe and drill press.

Va., Richmond—Thompson Auto Repair Co., 509 West Marshall St.—lathe and drill press.

Wis., Kiel — Hingess & Bessler, c/o A. Hingess—automobile repair machinery for proposed $45,000 garage at Chilton.

Wis., Milwaukee—J. P. Meehan, 266 27th St. (garage)—drill press and air compressor.

Wis., Milwaukee—Thust Machine Co., c/o L. N. Biron, 306 Mitchell Bldg.—machine tools for the manufacture of glueing and wrapping machines for making paper boxes.

Wis., Wausau—D. J. Murray Mfg. Co., 1002 3rd St., (manufacturer of saw mill machinery), D. L. Bellinger, Purch. Agt.—drill press, lathe, grinders and small tools (used preferred).

Ont., Guelph—B. Tolton & Son, 173 Woolwich St.—garage and repair shop equipment to replace that which was destroyed by fire.

Ont., St. Thomas—City Gas Dept., E. H. Caughell, City Hall, Engr.—one 16 in. x 8 ft. lathe, screw cutting; one 20 in drill, back gear, self feed; one 10 x 14 in. shaper.

Machinery Wanted

Ala., Birmingham — Western Newspaper Union, 213 North 17th St.—Cottrell or Omaha press with folder.

Ark., Pine Bluff—Merit Veneer & Box Co., Inc., J. Dent, Dir.—machinery and equipment for the manufacture of wire bound boxes, crates and veneer box products.

Ark., Thornton—The Stout Lumber Co.—machinery and equipment for proposed lumber mill, to replace that which was destroyed by fire.

Calif., Nipinnawasee — S. G. Smartt (woodworker)—power planer.

Calif., San Francisco—G. Lomer, 378 3rd St.—small tools for cabinet work.

Fla., Fort White—Fort White Package Co. (wooden box manufacturer)—machinery and equipment for plant.

Ill., Chicago—Central Storage Co., 1422 St. Louis Ave.—electric crane and derrick.

Ill., Chicago—M. M. Rothschild, 712 Federal St.—two color automatic presses.

Ill., Chicago—Wanner Machine Co., 716 South Dearborn St. (printers' supplies)—26 x 34 Miehle press, power paper cutter and a small power job press (used).

Ill., Chicago—W. E. Williams, 332 South La Salle St.—electric spot welder (used).

Ind., Bedford—The Democrat—12 x 15 in. job press, belting, hangers, pulleys and shafting for motor power.

Kan., Abilene—The Chronicle—linotype, model No. 1 preferred.

Mass., Cambridge — Hingham Knitting Co., Charles River Parkway, (knit goods)—3½ in. cylinders for 200 needle "Banner" knitting machines.

Mass., East Boston (Boston P. O.)—A. Martin, 193 Trenton St.—laundry machinery and equipment, including several four pocket washers and extractors (used).

Mass., North Leverett—D. Glazier (woodworker)—55 ft. of 16 in. 2 ply leather belt, also miscellaneous belting in smaller widths and lengths.

Mass., Somerville — The Progressive Laundry, 203 Pearl St.—extractor, washing machines, dryer, etc. (used).

Mich., Detroit — J. Jesseph, 8941 West Jefferson St. (cabinet maker)—power band saw.

Mich., Grand Haven—Daily Tribune—magazine for model No. 5 linotype.

Mich., Highland Park—Ford Motor Co.—miscellaneous equipment for the manufacture of plate glass and converting it into wind shields.

Mich., Highland Park—Ford Motor Co.—gas producers, also coal and ash handling equipment for proposed gas producer plant at Flat Rock.

Mich., Highland Park—Ford Motor Co.—overhead cranes, conveyors, etc., for proposed transfer building.

Mo., Kansas City — Bauer-The-Woodworker, 111 West 18th St., A. Bauer, Purch. Agt.—Universal woodworker.

Mo., Kansas City—Bd. Educ., Purchasing Dept.—floor surfacing machine for Lathrop Manual Training School.

Mo., Kansas City—Kansas City Journal-Post, 8th and McGee Sts.—printing equipment.

Mo., Kansas City—W. Pierce, 2026 Campbell St.—oil well driller.

Mo., Kansas City—Rutherford Flavoring Co., 1619 East 8th St., M. Rutherford, Purch. Agt.—canning retorts.

Mo., St. Louis—E. Stempfle, 4004 Lincoln Ave. (woodworker)—small band saw, 28 or 30 in., motor driven.

Mo., St. Louis — Western Newspaper Union, 3rd and Walnut Sts.—one 10 x 15 in. job press.

Neb., Omaha — Bd. Educ., c/o W. T. Bourke, Secy., 603 City Hall—manual training equipment for proposed $750,000 high school.

N. H., Keene—Keene Silk Fibre Mills—gas or electric singeing machine for silk yarn.

N. H., Nashua—The International Paper Box Machine Co., 315 Main St.—milling machine, planer type, slab miller, 12 to 14 ft. table, 30 in. between housings (used).

N. J., Englishtown — The Englishtown Carpet Co., A. Muldoon, Pres.—twenty looms for proposed factory.

N. Y., Avoca—Avoca Weekly News, G. Peterson, owner—printing machinery and equipment to replace that which was destroyed by fire.

N. Y., Avon—A. J. Stewart—one wood turning lathe.

N. Y., Buffalo—F. Ahrens, 1262 Genesee St.—machinery for the manufacture of candy.

N. Y., Buffalo—E. J. Alberson, 819 Tonawanda St.—equipment for bakery.

N. Y., Buffalo—F. Beck, Abbot Rd. and Kimmel St.—machinery and equipment for proposed factory for mechanically curing and smoking boiled hams.

N. Y., Buffalo—Drouillard Mfg. Co., 460 East Eagle St.—machinery for the manufacture of ice cream cones.

N. Y., Buffalo—J. Grebaum, 1869 Niagara St.—14 x 21 in. Universal or Pearl printing press.

N. Y., Buffalo — The Mary Lee Candy Shoppe, 1123 Bway.—machinery for the manufacture of candy.

N. Y., Buffalo—R. M. Murphy, 153 Wallace Ave.—bakeshop equipment

N. Y., Buffalo—R. J. Sweet, 1189 Niagara St.—welding and machine repairing machinery.

N. Y., Buffalo—W. T. Teese, 1087 Genesee St.—welding equipment for electric welding shop.

N. Y., Buffalo—G. Urban Milling Co., 200 Urban St.—equipment for blacksmith shop.

N. Y., Canajoharie—Beech Nut Packing Co.—equipment for proposed branch factory at Hamilton, Ont.

N. Y., Dunkirk—Continental Heater Co., Otter St.—machinery for proposed addition to plant for the manufacture of boiler parts and cores.

N. Y., Jamestown—Bd. Educ.—vocational equipment for proposed $350,000 junior high school.

N. Y., Lake View—Acme Shale & Brick Co.—machinery and equipment for proposed tile manufacturing factory on the Pierce Farm.

N. Y., New York—A. G. Schoonmaker, 25 Church St.—air coupressor 2 cylinder type, 140 to 160 cu.ft.

N. Y., Olean—Kulp, Inc., C. W. Kulp, Pres.—machinery and equipment for the manufacture of art goods and novelties.

N. Y., Palmyra—Palmyra Pump & Accessories Co.—machinery and equipment for proposed plant for manufacturing patented headlight non-glaring device for automobiles.

N. Y., Rochester—M. D. Knowlton Co., 28 Industrial St., manufacturer of paper boxes—machinery and equipment for proposed addition to plant.

N. Y., Rochester—Newman Bros. Grain Co., 304 Troup St.—milling equipment for proposed addition to grain mill.

N. Y., Rochester—W. B. Williams, 295 Monroe Ave.—equipment for proposed addition to paint shop.

N. Y., Rochester—Wood Specialties, Inc., 124 Railroad St.—one variety saw table.

N. Y., Wilson—Niagara County Preserving Co.—small power hydraulic press.

O., Canton—Klingstedt Bros. Co., Cleveland Ave., V. W. Klingstedt Purch. Agt.—machinery and equipment for proposed $75,000 printing plant.

O., North Canton — Hoover Suction Sweeper Co.—additional machinery and equipment.

O., St. Clairsville—H. G. Nichol, Box 176—power paper cutter.

O., Warren — The Alloy Electric Steel Casting Co. (manufacturer of electric furnace and open hearth steel castings)—machinery and equipment for new plant.

Okla., Tulsa—W. Huddleson, R. R. No. 4—$2,000 worth of newspaper equipment, including job press and newspaper press.

Ore., Philomath—The Review—6 or 7 column folio newspaper press.

Pa., Ashland — Bd. Educ. — vocational equipment for new $125,000 high school.

Pa., Bridgeport—Bd. Educ.—vocational equipment for proposed high school.

Pa., Coopersburg—The Coopersburg Improvement Co.—machinery and equipment for new granite polishing plant.

Pa., Corry—Bd. Educ.—vocational equipment for new $125,000 school.

Pa., Erie—A. Baker, 2415 Wayne St.—22 in. paper cutting machine.

Pa., Freeland — Washington Silk Co. — machinery and equipment for silk manufacturing factory.

Pa., Girard — Girard Model Wks., Inc., S. L. Connell, Dir.—machinery for the manufacture of wire shapes, small springs and mechanical toys.

Pa., Lansford—Lehigh Coal & Navigation Co.—machinery and equipment for $45,000 coal washing plant at Tamaqua, to replace that which was destroyed by fire.

Pa., Meadville—The Meadville Iron Co., Inc., Mill St.—machinery and equipment for one story addition to iron works.

Pa., New Castle—The Newcastle News, F. Rentz, Mgr.—motors, shafting, belting and hangers.

Pa., New Holland—Bd. Educ.—vocational equipment for proposed $100,000 school.

Pa., Oil City—Oil City Boiler Wks., 351 Seneca St.—machinery and equipment for large addition to factory.

Pa., Phila.—Electric Storage Battery Co., 19th and Allegheny Sts.—equipment for proposed branch factory in Kansas City, Mo.

Pa., Pringle (Wilkes-Barre P. O.)—Bd. Educ.—vocational equipment for proposed $85,000 school.

Pa., Reading—J. Biehl Wagon & Auto Wks., 31 South 5th St.—machinery and equipment for new two story plant for the manufacture of automobile parts and equipment, at West Reading.

Pa., Rochester—M. R. Regan—carload of thread protectors.

Pa., Throop — Bd. Educ.—vocational equipment for new $175,000 school.

Pa., Towanda—Bradford County Coal & Oil Co., J. Conklin, Dir.—pumping machinery and drilling equipment for new oil well.

Pa., Troy—Bd. Educ.—vocational equipment for proposed $100,000 high school.

Pa., Uniontown—Provant Coal Co.—machinery and equipment for new coal tipple, fan house and mechanical draft department.

Pa., Warren—J. T. Newell, 244 Penn Ave.—additional machinery and equipment for proposed 4 story printing plant on Liberty St.

R. I., Pawtucket — Lumb Knitting Co., Central Ave.—cylinders and dials, 14 cut, for 17, 18, 19, 20, 21 and 22 in. body machines.

R. I., Providence—Eddy Finishing Co., H. A. Clason, 1008 Turks Head Bldg., Purch. Agt.—cotton goods printing and dyeing machinery for plant (being organized).

S. D., White Lake—The White Lake Cooperative Creamery Assn., J. L. Jensem, Secy. and Mgr.—cream vats, paraffiner, tester, rotary and deep well pumps, shafting, hangers, belting, mostly double leather, pulleys, water storage tanks, pipes and fittings, pipe cutting tools, vise, dies, etc.

Tenn., Chattanooga—The Dixie Spinning Mills—complete machinery for spinning mill.

Tex., Fort Worth—Southwest, 844 Monroe St. (newspaper)—power job press and paper cutter.

Tex., Kenedy—The Kenedy Ice & Electric Co.—laundry equipment.

Va., Petersburg—Petersburg Printing & Stationery Co., 17 East Bank St.—cylinder printing press.

Va., Richmond—T. W. McCabe, 20 South 10th St. (manufacturer of cornices, ventilators and roofing)—one steel cornice brake and one burring machine.

Va., Richmond—The Rosenthal Printing Co., 412 East Main St.—one large cylinder press.

Va., Winchester — Winchester Lumber Co., W. B. Cornell, Pres.—machinery and equipment for proposed lumber mill at Gore.

Wis., Auburndale—W. Schmidt (grist mill)—feed grinding machinery, gasoline engine or motor power.

Wis., Cuba—J. Selleck & Co.—zinc mining and crushing machinery.

Wis., Jump River—Crane Lumber Co.—saw mill machinery, belting, shafting and hangers.

Wis., Kaukauna—The Ground Wood Pulp Supply Co.—machinery and equipment, including grinders, for proposed pulp mill.

Wis., Kaukauna—P. A. Mitchell—storage tanks, pumps and equipment for proposed filling station.

Wis., Marshfield — Roddis Lumber & Veneer Co., East 2nd St., H. Roddis, Purch. Agt.—medium size planer.

Wis., Milwaukee — The Natl. Knitting Co., 905 Clinton St.—knitting machines for proposed addition to factory.

Wis., Milwaukee—E. F. Seybold, 342 6th St. (produce)—refrigeration machinery.

Wis., Park Falls—Hines Lumber Co.—power machinery for proposed $75,000 saw mill at Loretta near Draper.

Wis., Racine—Racine Pine Mills Co., 1010 13th St. (dairy products)—steam driven refrigeration machinery.

Wis., Slinger—L. A. Burg—storage tanks and pumps for proposed garage.

Ont., Brantford—Brantford Roofing Co., Ltd. (manufacturer of asphalt roofing products), C. M. Thompson, Mgr.—roofing machinery.

Ont., Hamilton—Standard Underground Cable Co. of Canada, Ltd., T. D. Waring, Mgr.—machinery for stranding and cabling of wire and cables, also electrically driven pumps for operating hydraulic presses.

Ont., Stratford—W. W. Camp (manufacturer of peat)—machinery and equipment for the manufacture of briquettes.

Ont., Windsor—Wilkie Products Co., 312 Pitt St., W.—equipment for proposed factory for the manufacture of piston rings and garage equipment at Tillsonburg.

Que., Montreal — Howard Smith Paper Mills, Ltd., 138 McGee St., C. H. Smith, Pres.—complete equipment for bleached soda pulp plant.

Australia, New South Wales, Sydney—L. P. R. Bean & Co., Ltd., 229 Castlereagh St. (electrical engineers and importers of electrical supplies and machinery), L. P. R. Bean, Purch. Agt.—refrigerating machinery for restaurants, hotels and domestic use, also ice making machines, electrically operated.

Metal Working Shops

Ala., Bessemer—The Nashville Bridge Co., Shelby Ave., Nashville, Tenn., will build a fabricating plant, here. Estimated cost $85,000. A. J. Dyer, Pres.

Calif., Chico—Chico High School District will build a shop building for the high school. Estimated cost $20,000. R. H. Camper, Secy.

Calif., Fresno—The United Engine & Machine Co. plans to build a machine shop, foundry and molding shop, pattern shop and forge building for the manufacture of heavy castings, valves and piston rings as a specialty.

Calif., San Francisco — The city and county of San Francisco, Bd. of Park Comrs., Park Lodge, Golden Gate Park, will soon receive bids for the construction of repair shops and sheds. Estimated cost $24,400.

Conn., Bridgeport — The Belknap Mfg. Co., Union Ave., awarded the contract for the construction of a 2 story, 20 x 60 ft. addition to its plant for the manufacture of water fittings. Estimated cost $12,000.

Ill., Chicago—F. D. Chase, Inc., Archts., 645 North Michigan Ave., receiving bids for the construction of a 1 story, 124 x 173 ft. factory at 5800-5814 Throop St., for the Goldsmith Bros. Smelting & Refining Co., 29 East Madison St. Estimated cost $55,000.

Ill., Chicago — L. G. Hallberg & Co., Archts., 116 South Michigan Ave., receiving bids for the construction of a 1 story, 30 x 112 ft. factory on 103rd St. and Hoyne Ave., for the Chicago Steel & Wire Co., 10257 Torrence Ave. Estimated cost $15,000.

Ill., Chicago—T. G. Hallberg & Co., Archts., 116 South Michigan Ave., will soon receive bids for the construction of a 1 story, 68 x 190 ft. addition to garage for Huguelot Bros., 908 Gary St. Estimated cost $50,000.

Ill., Elgin—The Elgin Stove & Oven Co., 14 Chicago St., awarded the contract for the construction of a 3 story factory on State and Schiller St. Estimated cost $100,000. Noted Feb. 23.

Ky., Ashland — The Amer. Rolling Mill Co. awarded the contract for the construction of an addition to its plant, including a jobbing and sheet mill, also a galvanizing plant.

Mass., Hyde Park (Boston P. O.)—The Tileston & Hollingsworth Co., 49 Federal St., Boston, manufacturer of paper and cardboard, awarded the contract for the construction of a 1 story addition to its machine shop, here. Estimated cost $40,000.

Mass., Somerville — C. R. Bowlby, 16 Thorndike St., West Somerville, will build a 4 story, 60 x 75 ft. garage on Buena Vista Rd., here. Estimated cost $40,000.

Mich., Flat Rock—A. Kahn, Archt., 1000 Marquette Bldg., Detroit, is receiving bids and will open same about Nov. 4 for the construction of a 2 story, 59 x 148 ft. gas producer plant, including coal hopper, here, for the Ford Motor Co., Highland Park.

Minn., St. Paul—The American Radiator Co., 1807 Elmwood Ave., Buffalo, N. Y., is having plans prepared for the construction of a plant for the manufacture of radiators, including foundry, machine shop, warehouses, etc., on a 525 x 120 ft. site, on Prior Ave., here. Estimated cost $1,500,000. J. F. Groebe, c/o owner, Engr.

Mo., Joplin—The Norton Taxicab Co., 6th and Wall Sts., plans to build a 2 story, 100 x 155 ft. garage and machine shop at 520 Wall St. Estimated cost $35,000. V. Norton, Pres. Architect not selected.

Mo., Kansas City—The Electric Storage Battery Co., 19th and Allegheny Sts., Phila., Pa., awarded the contract for the construction of a 1 story, 160 x 220 ft. branch factory on Belmont St., here. Estimated cost $150,000.

N. J., Trenton — The Eberhard Watch Corp., Commonwealth Bldg., plans to build a plant for the manufacture of watches. G. F. Eberhard, Pres.

N. Y., Dunkirk—The Continental Heater Co., Otter St., awarded the contract for the construction of a 1 story, 64 x 220 ft. addition to its plant for the manufacture of boiler parts and cores.

N. Y., New York—The Canter Constr. Co., c/o F. Parker, Engr. and Archt., 44 Court St., Brooklyn, will build a 2 story, 150 x 195 ft. garage on Park Ave. and 164th St., here. Estimated cost $150,000.

N. Y., New York—The 425 West 54th St. Realty Co., c/o F. A. Rooke, Engr. and Archt., 15 East 40th St., will build a 6 story, 75 x 90 ft. garage at 421 West 54th St. Estimated cost $125,000. C. Scott, Pres.

N. Y., New York—The Transit Comn., 49 Lafayette St., awarded the contract for the construction of foundation for the third addition to its shops on Lenox Ave. and 148th St. Noted Oct. 19.

O., Cleveland — The Lees-Bradner Co., 6210 Carnegie Ave., manufacturer of machine tools, is having plans prepared for the construction of a 3 story addition to its factory. Estimated cost $100,000. E. G. Lees, Pres. Private plans.

O., Cleveland — The National Screw & Tack Co., c/o F. G. Walker, 2440 East 75th St., is having plans prepared for the construction of a 5 story factory on Platt Ave. near East 76th St. Estimated cost $400,000. F. G. Walker, c/o owner, Archt.

O., Cleveland—The Otis Steel Co., c/o R. Brakeman, Engr. and Archt., 3341 Jennings Rd., is having plans prepared for the construction of a 1 story steel mill, including blooming mill, strip mill and open hearth furnaces, on Jennings Rd. Estimated cost $3,000,000.

O., Cleveland — The Vance Motor Co. (Ford agents) awarded the contract for the construction of a 2 story, 63 x 132 ft. garage on East 9th St. and Central Ave. Estimated cost $100,000.

O., Cleveland Heights (Warrensville P. O.)—The Heights Battery Co., c/o J. Herman, 2777 Mayfield Rd., awarded the contract for the construction of a 2 story, 50 x 100 ft. garage at 2770 Mayfield Rd. Estimated cost $40,000. Noted June 2, 1921.

O., East Cleveland — The Pollock-Davis Co., 11628 Euclid Ave., awarded the contract for the construction of a 2 story, 72 x 74 ft. garage. Estimated cost $40,000.

O., Kent—The Lamson & Sessions Co., 2188 Scranton Rd., Cleveland, manufacturer of nuts, bolts and rivets, have had plans prepared for the construction of a 1 story, 168 x 200 ft. factory, here. Estimated cost $125,000. G. S. Rider & Co., Century Bldg., Engrs. and Archts.

Pa., Ambridge — The National Metal Moulding Co. will build a 1 story, 98 x 100 ft. cafeteria and shop building.

Pa., Coraopolis — The Standard Steel Spring Co. awarded the contract for the construction of a 1 story, 64 x 141 ft. factory building. Noted June 22.

Pa., McKees Rocks—The Federal Enameling & Stamping Co., Thompson Ave., will build a 3 story factory for the manufacture of tin and enameled wares.

Pa., Phila. — Neubauer & Supowitz, Archts., 929 Chestnut St., are receiving bids for the construction of a 2 story, 50 x 100 ft. garage and hall on Wyoming Ave. and Mascher St., for P. Randolph, 41 East Poplar St. Estimated cost $100,000.

Pa., Pittsburgh—The Fleishman Yeast Co., 801 Washington St., New York City, awarded the contract for the construction of a 2 story, 75 x 192 ft. agency and garage building on Allegheny and Western Sts., here. Estimated cost $50,000. Noted June 22.

Pa., Tamaqua—The Lehigh Coal & Navigation Co., Lansford, plans to rebuild its coal washing plant which was recently destroyed by fire, here. Cost between $45,000 and $50,000.

Tenn., Knoxville — The Cherokee Motor Co., 314 State St., plans to build a 3 story, 100 x 150 ft. addition to its garage and repair shop. Estimated cost $75,000. C. Reed, Pres.

W. Va., Huntington—The Armstrong Mfg. Co. awarded the contract for the construction of a 1 story, 108 x 201 ft. addition to its plant for the manufacture of hardware and specialties. Noted Oct. 19.

Wis., Chilton—Hingess & Bessler, c/o A. Hingess, Kiel, plans to build a 2 story, 60 x 100 ft. garage, here. Estimated cost $45,000. Architect not selected.

Wis., Milwaukee — The Milwaukee Air Pump Co., 886 3rd St., awarded the contract for the construction of a 1 story, 130 x 150 ft. factory and office building on Keefe Ave. Estimated cost $50,000. Noted Oct. 5.

Wis., Slinger—L. A. Burg will build a 1 story, 60 x 90 ft. garage. Estimated cost $40,000. Noted Oct. 12.

Wis., West Bend—The Amer. Service & Storage Garage, c/o M. A. Johannes, Ashford, R. D., Campbellsport, awarded the contract for the construction of a 1 story, 60 x 80 ft. garage. Estimated cost $40,000. Noted Oct. 19.

Ont., Guelph—B. Tolton & Son, 173 Woolwich St., plan to rebuild their garage and repair shop which was destroyed by fire. Estimated cost $45,000.

Ont., Tillsonburg—The Wilkie Products Co., 312 Pitts St., W., Windsor, Ont., plans to build a 60 x 200 ft. factory for the manufacture of piston rings and garage equipment, here. Estimated cost $100,000.

General Manufacturing

Ala., Birmingham—The city awarded the contract for the construction of a 2 story, 150 x 200 ft. market house, including complete refrigerating plant on 3rd Ave. and 23rd St. Estimated cost $195,000.

Ala., Birmingham—The Lehigh Portland Cement Co., Young Bldg., Allentown, Pa., awarded the contract for the construction of a cement mill, capacity 1,000,000 bbl. per year, here. Noted Oct. 5.

Ark., Thornton—The Stout Lumber Co. plans to rebuild its lumber mill which was destroyed by fire. Estimated cost $200,000.

Calif., Fresno—Black's Package Co., 1025 Van Ness Ave., is having plans prepared for the construction of a 2 story, 200 ft. frontage, stores building and refrigerating plant. Estimated cost $150,000. R. F. Felchlin Co., Bank of Italy Bldg., Engrs. and Archts.

Calif., San Francisco — P. Grassi, 808 Arguello Blvd., awarded the contract for the construction of a 1 story, 120 x 120 ft. marble and terrazzo products factory on San Bruno Ave. Estimated cost $5,000.

Ill., Chicago—E. J. Brach & Sons, 215 West Ohio St., awarded the contract for the construction of a 3 story, 100 x 300 ft. candy factory on Kinzie and Cicero Sts. Estimated cost $1,000,000. Noted Oct. 19.

Ill., Chicago—The Imperial Box Co., Inc., 1506 Carroll St., awarded the contract for the construction of a 1 story, 70 x 110 ft. factory at 1536-40 Carroll Ave. Estimated cost $25,000.

Ia., Sioux City—The Hanford Produce Co., 1st and Court St., awarded the contract for the construction of a 3 story, 100 x 150 ft. cold storage warehouse and ice plant on 1st and Virginia Sts. Estimated cost $100,000.

Me., Lewiston—The Bates Mfg. Co. has had plans prepared for the construction of a 4 story, 170 x 370 ft. addition to its plant for the manufacture of gingham goods. Estimated cost $600,000. Architect not announced.

Mass., Everett—Stone & Forsyth Co., 67 Kingston St., Boston, awarded the contract for the construction of a 2 story, 18 x 46 ft. addition to its paper plant on Spring St., here. Estimated cost $15,000.

Mass., Fall River—The Sagamore Mfg. Co., Benefit St., awarded the contract for the construction of a 2 story, 75 x 96 ft. addition to its plant No. 1. Estimated cost $40,000.

Mass., Somerville—The Mitchell Bakery Co., South St., Cambridge, awarded the contract for the construction of a 1 story, 65 x 90 ft. bakery on Vine St., here. Estimated cost $30,000.

Mich., Flat Rock—A. Kahn, 1000 Marquette Bldg., Detroit, is receiving bids and will open same about Nov. 4, for the construction of a 1 story, 242 x 761 ft. plate glass factory, here, for the Ford Motor Co., Highland Park. Estimated cost $1,500,000.

N. J., Englishtown — The Englishtown Carpet Co. awarded the contract for the construction of a 2 story, 50 x 75 ft. carpet factory. Estimated cost $12,000. A. Muldoon, Pres.

N. J., Lambertville—The Jesperson Newsprint Corp. plans to rebuild its paper factory to replace the one which was recently destroyed by fire.

N. Y., Alfred—Reynold Bros. plan to rebuild their 4 story cheese factory and warehouse, which was destroyed by fire. Cost between $50,000 and $60,000. Architect not announced.

N. Y., Buffalo—The Pillsbury Flour Mills Co., 302 Metropolitan Life Bldg., Minneapolis, Minn., awarded the contract for the construction of a 10 story, 100 x 268 ft. flour mill, here. Estimated cost $1,000,000. A. C. Loring, Pres. Noted Oct. 19.

N. Y., Jamestown—The Alliance Furniture Co., Allen St., awarded the contract for the construction of a 4 story addition to its factory, to contain 20,000 sq.ft. floor space. Cost will exceed $35,000. Noted Oct. 12.

N. Y., Jamestown — The Empire Case Goods Co., 142 Foote Ave., awarded the contract for the construction of a 2 story addition to its furniture factory, to contain 7,000 sq.ft. floor space. Noted Oct. 12.

N. Y., Rochester—The Newman Bros. Grain Co., 304 Troup St., plans to build an addition to its grain mill. Estimated cost $25,000. Architect not announced.

Pa., Phila.—The J. B. Stetson Co., 5th St. and Columbia Ave., is having plans prepared for the construction of an 8 story, 62 x 75 ft. hat factory, a 1 story, 114 x 114 ft. garage and workshop, and a 1 story, 75 x 124 ft. machine and repair shop on 4th St. and Columbia Ave. J. O. Potts, 5th St. and Montgomery Ave., Archt.

Tenn., Kingsport—The Mead Fibre Co. awarded the contract for the construction of a 2 story, 75 x 275 ft. paper mill. Estimated cost $350,000. Noted Oct. 5.

Wash., Tacoma—The Northern Furniture Co., South Water St., Sheboygan, Wis., is receiving bids for the construction of a 4 story, 110 x 150 ft. furniture factory on Edison St., here. Estimated cost $60,000. W. C. Weeks, 720 Ontario Ave., Sheboygan, Wis., Archt.

Wis., Delevan—The State Bd. of Control, M. J. Tappins, Secy., Madison, awarded the contract for the construction of a 1 story cold storage plant, here. Estimated cost $40,000.

Wis., Fond du Lac—The Model Laundry Co., 66 Macy St., plans to build a 2 story, 60 x 90 ft. addition to its laundry, etc. Estimated cost $40,000. Architect not selected.

Wis., Green Bay—E. J. Balza Co., 327 Main St., is having plans prepared for the construction of a 2 story, 50 x 95 ft. pickle factory. Estimated cost $40,000. E. J. Balza, Mgr. Private plans.

Wis., Green Bay—Brown County, c/o H. F. Wittig, Clk., Court House, will build a 2 story, 70 x 95 ft. laundry. Estimated cost $40,000. Noted Sept. 14.

Wis., Green Bay—The Fairmont Creamery Co., 200 North Bway., awarded the contract for the construction of a 2 story, 100 x 105 ft. dairy and power boiler house. Estimated cost $60,000. Noted Sept. 21.

Wis., Milwaukee — The Air Reduction Sales Co., 2236 South Lumber St., Chicago, awarded the contract for alterations to its 1 story factory on Buffum St., here. Estimated cost $30,000.

Wis., New Holstein—The New Holstein Canning Co. will build a 1 story, 60 x 160 ft. canning factory. Estimated cost $40,000. A. T. Hipke, Secy.

Wis., Oconto—The Elsnore Veneer Co. will build a 1 story, 90 x 150 ft. veneer factory. Estimated cost $40,000. J. O. Atwater, Mgr. Noted Oct. 5.

Wis., Plymouth—The Phenix Cheese Co. is having plans prepared for the construction of a 5 story, 30 x 60 ft. cheese factory. Estimated cost $60,000. R. A. Harbach, Mgr. Singer-Pelstein Co., 9 South Clinton St., Chicago, Archts. Noted Aug. 29.

Wis., Racine—The Belle City Malleable Iron Co. plans to build a 1 story, 45 x 50 ft. gas plant for annealing and core ovens. Estimated cost $40,000. C. S. Anderson, Mgr. Architect not selected.

Wis., Racine—The Davies Shoe Mfg. Co., Northwestern and Carlisle Sts., plans to build a 2 story, 75 x 150 ft. shoe factory. Estimated cost $100,000. C. Davies, Pres. Architect not selected.

Wis., Racine — The Wisconsin Gas & Electric Co., 305 6th St., awarded the contract for the construction of a 1 story, 50 x 95 ft. gas plant. Estimated cost $40,000. Noted Aug. 17.

Wis., Union Grove — The State Bd. of Control, M. J. Tappins, Secy., 902 Garfield St., Madison, awarded the contract for the construction of a 1 story, 50 x 90 ft. laundry at the Wisconsin Home for Feeble Minded, here. Estimated cost $40,000. Noted Oct. 5.

Wis., West Bend—The West Bend Concrete Products Co. awarded the contract for the construction of a 2 story, 50 x 65 ft. factory for the manufacture of drain tile and concrete products. Estimated cost $40,000.

B. C., Powell River—The Powell River Co., Ltd., is having plans prepared for the construction of a 2 story, 80 x 360 ft. addition to its paper mill. Estimated cost $200,000. R. Bell-Irving, Powell River, Archt.